Marlborough Lines Network Standard

DN005 Network Connection Standard

DOCUMENT ISSUE STATUS

Issue	Section	Page	Revision Detail	Reviewed By	Approved By	Date
A	All	All	Newly implemented standard	B. Sutherland		18/03/2022
A			General review with minor changes	S. Wilkinson		18/5/2022
A	All	All	Final issue	B. Sutherland		30/05/2022
A.1	5.5.2	17	Clarified SWER network limits	B. Sutherland	R. Brown	23/11/2022
A.2	5.5	17,18	Added further load restricted areas.	B. Sutherland	R. Brown	17/04/2023

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1 General

1.1 Purpose

This standard is to define the requirements and responsibilities of parties with equipment connected (or to be connected) to the Marlborough Lines Limited's (MLL's) electricity network.

1.2 Scope

Detail the technical requirements or guidelines for:

- Health and Safety management on the MLL network.
- Customers to establish, maintain and modify connections to MLL's electricity network.
- Ownership boundaries and responsibilities between customers and MLL.
- The requirement for the supply of connection information, including as-built information relating to the connected consumer installation for MLL's records.

This standard does not cover MLL's distributed generation requirements. These are covered under separate standards that can be found on our website.

1.3 Health, Safety and Environment

MLL takes the safety of customers, employees, contractors, and members of the public very seriously. Any work conducted on and around MLL's equipment by external parties must be conducted in line with MLL's policies and standards.

1.4 Summary of Roles and Responsibilities

Responsible Party	Technical Requirement
Electrical Service Providers (*Employed by Customer)*	• Design and install equipment and fittings according to the latest legislation and best practices such as AS/NZS3000, Electrical Codes of Practices, Electricity Act 1993, Electricity (Safety) Regulations 2010 and the Health and Safety at Work Act 2015. • Understand the contents of this standard and comply with MLL's requirements. • Installation must have a Certificate of Compliance. • Provide customers with technical support for their installation. • Maintain customer's installation, including fault restoration.
Electricity Customer *(Property owner or occupier)*	• Maintain installation so that safety hazards are controlled. • Undertake mandatory periodic maintenance as per section 3.2 (special installations only). • Maintain minimum electrical clearance from MLL's live equipment as per section 3.4. • If MLL's equipment is installed on their property, they must provide unobstructed access to this requirement at all times as per section 3.5.
Electricity Retailer	• Install and manage customer's metering. • Select the appropriate electricity tariff in respect of the customer. • Establish a contract for the delivery of lines services with the customer. • Charge the customer for energy and lines services.
MLL	• Manage the process for new connections or modifications to existing connections, including the setting of conditions or requirements as part of any network connection approval • Manage MLL's electricity network to deliver a safe and reliable electricity supply to customers.

1.5 References, Standards and Codes

The following documents are referred to in this standard or provided background material for the development of this standard:

MLL Document	Description
CN004	As-built Standard
DN002	Network Fuse Protection Standard
DN003	Design Criteria and Philosophy Standard
DN004	Network Easement Standard
DN007	Network Overhead Line Design Standard
DN008	Network Underground Cable Design Standard
DN009	Network Substation Design Standard
DN010	Network Earthing Standard

External Document	Description
AS/NZS 3000	Electrical installations (known as the Australian/NZ wiring rules)
AS/NZS 61000.3	AS/NZS 61000.3.3 Electromagnetic compatibility (EMC) Part 3.3 Limits - Limitation of voltage changes, voltage fluctuations and flicker in public LV supply systems, for equipment with rated current less than or equal to 16A per phase and not subject to conditional connection. AS/NZS 61000.3.5 Electromagnetic compatibility (EMC) Part 3.5 Limits - Limitation of voltage fluctuations and flicker in LV supply systems, for equipment with rated current greater than 16A. AS/NZS 61000.3.7 Electromagnetic compatibility (EMC) Part 3.7 Limits - Assessment of emission limits for fluctuating loads in MV and HV power systems.
Electricity Safety Regulations (ESR)	NZ Regulations to ensure the health and safety of members of the public and prevent damage to property. Found here.
Electricity Industry Participation Code (EIPC)	The Electricity Authority's Electricity Industry Participation Code 2010 governs how the electricity market operates. (the code).
EEA Guides	• EEA Guide for the Connection of High Voltage Electrical Installations • EEA Power Quality Guide • Guide for Livening of Service Connections to Premises
Health and Safety at Work Act	WorkSafe Health and Safety at Work Act

1.6 Definitions

The following definitions are referred to in this standard

Definition	Explanation
A or Amps	Abbreviation for 'ampere', a base unit of electrical current.
AC	Abbreviation for 'alternating current'.
Certificate of Compliance or CoC (Electrical)	A certificate issued by a licensed electrical worker to certify that installation or Part installation under Part 1 or Part 2 of AS/NZS 3000 are safe to be connected to the specified system of electrical supply.
Conductor	Material that allows the flow of electrical current in one or more directions.
CT metering	For installations larger than 100A three-phase, CT (current transformer) metering may be required to avoid the use of larger conductor connections for the revenue meters. The use of CT metering is subject to the requirements of the metering equipment owner.
Consumer/ Customer	Any person who is supplied, or who applies to be supplied with electricity from MLL's electricity network via a Point of Supply. Each customer site has a unique ICP number.

DC	Abbreviation for 'direct current'.
Earthed	Electrically connected to a general mass of earth and is regarded to be at zero potential.
Electric shock	Occurs upon contact of a (human or animal) body part with any live conductor that causes a magnitude of current to pass through the body.
Electrical appliance	Any device that consumes electrical power when connected to the customer's AC electrical supply.
Electrical Safety Certificate (ESC)	Provides a legally recognisable statement that the connected installation or part installation, or any fitting that supplies an installation or a part of an installation, is safe to use following prescribed electrical work. Note that this can be incorporated into the Certification of Compliance.
Electrical Service Provider	A person who is professionally qualified with qualifications recognised by the Electrical Workers Registration Board (https://www.ewrb.govt.nz) to carry out work on electrical installations. Depending on the type of work this may be a registered electrician, electrical installer, electrical maintainer, cable jointer or line mechanic.
Electricity Retailer	An entity that supplies electricity to another person.
Energy/Power	Energy is the ability to do work, measured in electricity distribution terminology as kilowatt-hours (kWh). Power is the measure of rate of use of energy and is defined in electricity distribution terminology as kilowatts (kW).
Fuse	Devices that protect electrical circuits by opening the circuit if the power exceeds its rated limit. Once a fuse is blown it needs to be replaced.
Generator	Equipment that can produce electricity.
High Voltage (HV)	Any voltage exceeding 1000 Volts AC or 1500 Volts DC.
HV Engineering Consultant	A specialist consultant who advises customers on the design of HV installations.
Installation	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 (as defined in the Electricity Act 1992 as “Electrical Installation"). Installations do not include household appliances that consume electricity.
Installation Control Point (ICP)	A unique identifier for each installation where a connection is made to the electricity network. Generally, there is one ICP for each installation, although some installations may have multiple ICP's due to multiple connections to the electricity network. The ICP is specific to the site location and not attached to the customer.
Isolate	The process of disconnecting the source of electricity supply from the installation. This is generally carried out by opening a switch or circuit-breaker, removing an isolating link or fuse or disconnecting a cable or line.
kV	Abbreviation for 'kilovolts’ or 1000 Volts.
Live	Means charged with electricity so that a difference in voltage exists to earth or between conductors.
Liven	The process of operating switching devices to electrically connect an installation to a source of electricity and allow electricity to flow to an installation.
Load	Any equipment or appliance that consumes electrical energy to perform its intended function, e.g. a fridge or TV. This includes any electrical losses incurred during the process.
Load management or Load control	Load management interrupts power to the nominated load to reduce electricity demand temporarily in accordance with the Use of System Agreement between MLL and the Electricity Retailer. Load control is commonly used on residential electric-water heaters. Customers that have load management installed on their premises may receive the benefit of a lower electricity tariff via their Electricity Retailer. MLL may load control to mitigate network or grid security issues.

Low Voltage (LV)	Any voltage exceeding 50 Volts AC or 120 Volts ripple free DC, but not exceeding 1000 Volts AC or 1500 Volts DC.
"MLL", "our", "we", "us"	MLL Limited
MLL's electricity network	Comprises a network of electrical lines, cables and other electrical equipment utilised to transport electricity to customers.
Metering equipment	Equipment that measures the quantity of electricity transported through an ICP and may include associated communications facilities to enable the transfer of metering information. A certified metering installation must meet the requirements of Electricity Industry Participation Code, part 10.
Overhead lines	Above ground conductors including its support structures used to transport electricity.
Paralleling	Arranging electrical loads with separate electrical pathways to the electrical supply.
PCBU	Person conducting a business or undertaking (as defined in the Health and Safety at Work Act 2015.
Point of Connection	A point at which electricity may flow into or out of a network.
Point of Supply	The point at which electricity equipment that exclusively supplies a property crosses that property boundary and: • if there are both high voltage lines and a transformer owned by MLL on the property, the Point of Supply is the point at which electricity from the transformer enters exclusive fittings; or • if there are non-exclusive fittings on the property, the Point of Supply is the point at which those fittings become exclusive fittings; or • if the exclusive fittings on the property are owned by a customer 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 licenced by the owner: or • if there is a specific agreement (e.g. with MLL or a Retailer) that any other point on the property is the Point of Supply, the Point of Supply is the agreed point, • (as defined in the Electricity Act 1992). However, for practical purposes, the Point of Supply is the isolating fuse located either on the boundary of the property or on the pole nearest to the property. Often the Point of Supply and the Point of Connection are at the same point. Please refer to section 10 to find where the Point of Supply is located in each type of configuration.
Prospective short circuit current	The highest electric current that can exist in an electrical system under fault conditions.
Record of Inspection (ROI)	Requirements for a record of inspection for electrical work is defined in Regulation 72 of the Electricity (Safety) Regulations 2010.
Residential area	Areas that are zoned residential in the local authority District Plan.
Residual current device (RCD)	A device for isolating supply to protected circuits, socket-outlets, or appliances in the event of a current flow to earth that exceeds a predetermined level.
Rural area	Areas zoned as rural in the local authority District Plan.
Service cable	An underground cable owned by the customer, that electrically connects the customer's switchboard to the Point of Supply.

Service Connection	The cable or overhead line on the customer's property beyond MLL's Point of Supply.
Service line	An overhead line owned by the customer, that electrically connects the customer's switchboard to the Point of Supply.
Service Box or Pillar	A fitting on MLL's LV distribution network which acts as the Point of Supply for customers supplied by an underground cable.
Switchboard	Consisting of a panel of mounted electric switches within a customer's installation, arranged so a number of circuits maybe connected or disconnected.
Temporary supply	A temporary connection usually required by builders or other tradespeople as an electrical supply at a worksite where there are no existing electrical network supplies available.
ToU	Abbreviation of "Time of Use"
Urban	Areas zoned as urban in the local authority District Plan.
Use of System Agreement	An agreement governing the terms and conditions on which Electricity Retailers use MLL's electricity network to convey electricity to customers.
Volts (V)	Abbreviation for the measure of voltage.

2 Connecting to MLL's Electricity Network

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

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

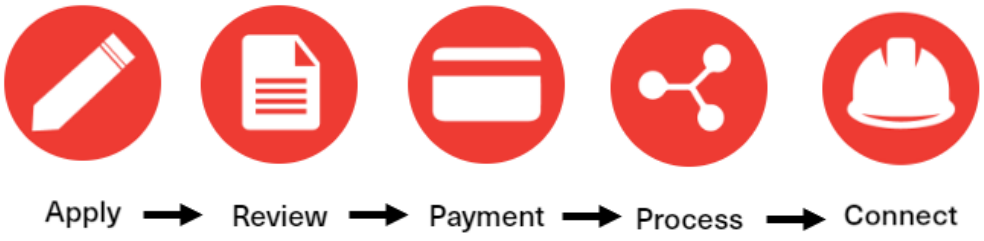
This section details the process for establishing a new connection to MLL's electricity network.

Connection contractors, authorised by MLL, build and liven the connections.

2.1 Summary of the application process for a new connection

The figure below depicts an overview of the processes required to establish a new connection. For full details refer to MLL's website. A brief summary of the process is included below for guidance purposes only.

Figure 2-1 Application process flow



Apply: Complete the online application form on MLL's website.

Review: MLL will review the application and confirm whether it is standard or complex, will advise applicant of next steps.

Payment: Payment of any application fees made by applicant to MLL.

Process: For standard connections, MLL will arrange for connection livening. For complex connections, prior to arranging for connection livening, we will prepare the network design and a customer works agreement which will set out the required customer capital contribution (the cost to construct the works, plus a development contribution) as well as any conditions of connection.

Connect: If customer acceptance (including payment) is received then works will commence, and connection can be established to our network (subject to any conditions of connection being met). Charges for connection livening may be applicable.

2.2 Determining the scope of the installation

Prior to applying for a connection on MLL's website it is important the customer understands the requirements (capacity, solar, EV charger, large appliances, etc) of their electrical installation to ensure they are applying for the appropriate connection.

In all cases it is recommended that the customer discusses requirements of the installation with the Electrical Service Provider carrying out the design of their installation prior to applying for a connection.

The customer and their Electrical Service Provider are responsible for scoping and applying for the correct connection. The customer or the Electrical Service Provider (but not both) will make an application to MLL for the connection.

When filling in the application form the following information must be supplied:

- the name and contact details of the applicant;
- the address of the connection;
- the capacity required (e.g. 60, 100 Amps, irrigation pump size);
- the number of phases required (e.g. one, two or three);
- the land title description (e.g. fee simple, leased, unit title or cross-leased);
- a description of what the connection will be used for e.g. residential, factory, irrigation;
- an accurate sketch (using an aerial photo) of the location helps us verify the connection in relation to our network and may reduce the time taken to process the application;
- preferred location of the connection and distance from the connection to any landmarks; and
- any generation that may be connected.

Once our requirements have been met and the application form processed, approval of the connection capacity will be confirmed in writing and MLL will assign an ICP number.

For larger or more complex new connections to the network, we will discuss any specific requirements with the applicant and an agreement, called a connection contract, will be established to formally record the required connection capacity and any other relevant legal requirements.

2.3 Guidelines for selecting Electrical Service Providers

The selection of qualified and suitable contractors and Electrical Service Providers for work on a customer's installation is the responsibility of that customer. A useful guide for getting electrical work done can be found on the WorkSafe website.

More information on competency and scope of works found can be found on the EWRB (Electrical Workers Registration Board) website.

2.4 Guidelines for engaging with Electricity Retailers

Electricity Retailers have an important role in setting up a new connection to MLL's electricity network. They accept the customer once the ICP is created by MLL and then arrange:

- the metering installation;
- provisions for load management (if applicable); and
- the customer's power plan.

It is recommended that an Electricity Retailer is engaged as early as possible to prevent these processes delaying the connection.

Load management requires the use of non-intrusive devices to interrupt power to nominated appliances in the premises to reduce network peak demand. Customers that have load management devices installed on their premises may be eligible for a lower electricity tariff from their chosen Electricity Retailer. For information on the electricity tariffs, refer to the Power Switch website.

2.5 Applying for temporary power supply

Temporary power supply may be required during construction, these are typically referred to as "Builders' Temporary Supplies". Applications for temporary power supply can be made via our website. The following needs to be considered when applying for temporary supply:

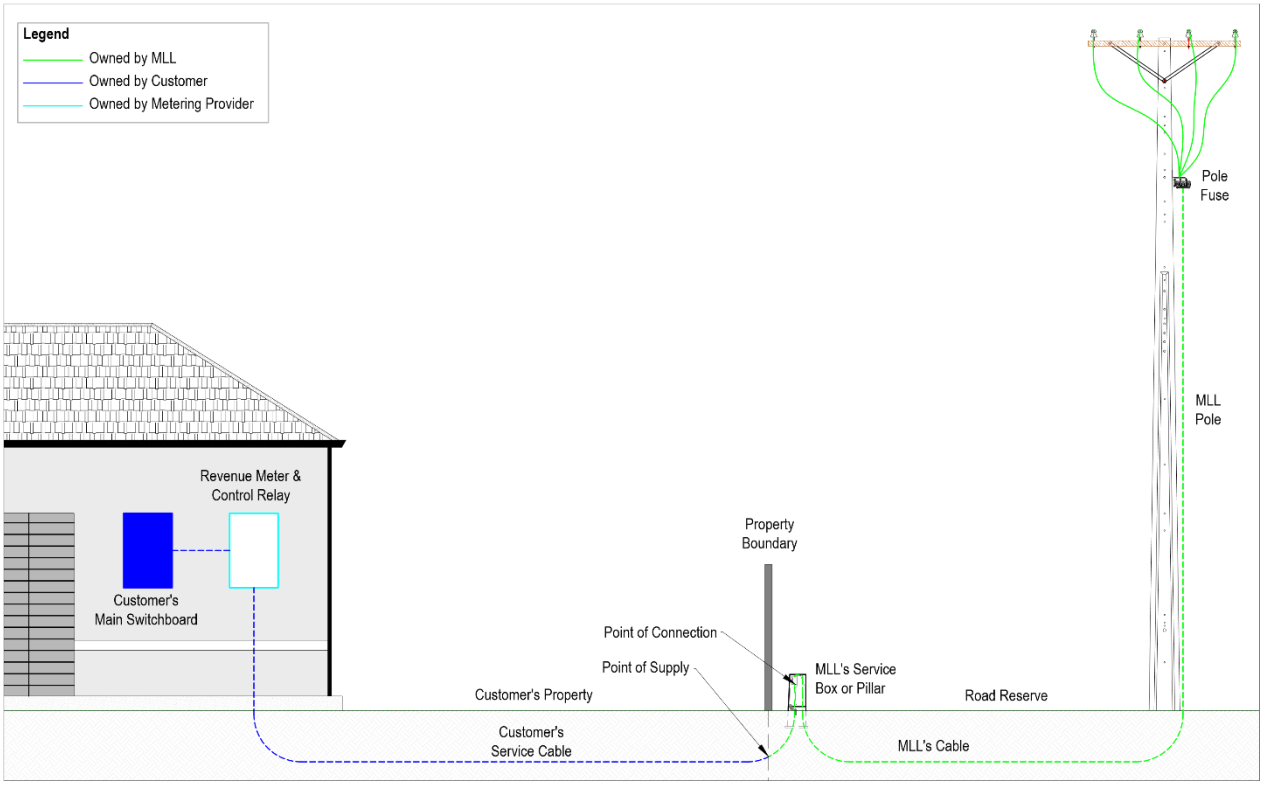
- Application for the temporary connection must be made prior to the application for the permanent connection. It is recommended to discuss requirements for a temporary supply with an Electrical Service Provider as early as possible.
- Main switchboards of temporary power supplies must be located on the Customer's property and not fixed to MLL's electricity network equipment.
- Temporary connections are made at the discretion of MLL and subject to availability of capacity in the network.
- In some cases, temporary connections can become the permanent connection at the end of the project. The customer should discuss with its Electrical Service Provider to see if this option is possible.
- The customer is responsible for the full cost of establishing a temporary connection.
- MLL permits temporary connections for up to six months for the purposes of enabling construction works prior to the connection of a permanent supply. Should the need for the temporarily supply continue beyond the six-month period, the customer is required to make an application for the supply to an Electricity Retailer.
- Customers must advise MLL by calling 03 577 7007 when the temporary supply is no longer required.

3 Information for Customers with Existing Connections

This section details guidelines for maintaining an electrical installation to prevent fire, safety incidents, compliance breaches and power outages.

3.1 What electrical equipment do I own and am responsible for?

Figure 3-1 Typical underground connection asset ownership



The diagram above shows a typical single dwelling that is connected to MLL's electricity network. For this type of connection, the customer owns and is responsible for the electrical equipment inside their property up to the Point of Supply.

The cost to repair or modify electrical equipment is the responsibility of the party that owns the equipment.

For customers with more complex connections to MLL's electricity network, refer to section 6 for details about the equipment they own and are responsible for.

3.2 Maintenance Activities

We recommend customers establish a maintenance regime that is appropriate for their installation to mitigate the risk of fire and electric shocks. For guidelines on what is mandatory refer to this WorkSafe website.

3.2.1 Low Voltage Installations

Most residential installations don't have prescribed mandatory routine maintenance, but the customer must still meet their legal and health and safety obligations.

The customer is responsible for the maintenance of their installation (equipment beyond the Point of Supply) and MLL takes no responsibility for this.

If you are ever unsure, it is suggested that the customer seeks advice to determine a maintenance regime that is appropriate for their installation.

3.2.2 High Voltage Installations

ESR regulation *62 High Voltage Installations* requires that HV installations are to be subject to a safety checking system as detailed in ESR regulation *40 Safety Checks of Works*.

The EEA publication *Guide for the Connection of High Voltage Electrical Installations* provides advice and guidance on the requirements. The consumer is to immediately advise MLL in any circumstance

where the installation is deemed electrically unsafe and shall provide evidence at MLL's request that the safety checking has been completed.

If the consumer does not comply with ESR Regulation *62 High Voltage Installations* and is not able to provide MLL with acceptable suitable documentation on request then the consumers installation shall be deemed to be "electrically unsafe" and shall be disconnected from the network in accordance with section 5.4.5 Electrically Unsafe Installations

3.3 Managing the risk of digging into service cables

Customers must always follow safe digging practices. If digging or excavation is proposed inside a customer's property and the location of the service cables is unknown, then it is strongly recommended that the customer contacts its Electrical Service Provider for advice as to where it is safe to excavate.

The latest information can be found on our website here.

For further guidelines about managing this risk, refer to the WorkSafe guidelines for excavation safety.

3.4 Restrictions for working or building near MLL's powerlines

It's important you're always aware of overhead lines and keep safe when working near them.

Buildings and structures must always be outside of the minimum safe distances for electricity networks. The consequences of building structures within the minimum safe distances of live electrical conductors are severe and life threatening.

The latest information can be found on our website here.

From time to time, MLL must maintain its overhead line equipment. Carrying out such maintenance activities will often require entry to the land beneath the overhead lines. Landowners should avoid building structures, planting trees or stacking objects beneath the overhead lines.

3.5 Responsibilities for customers with MLL's equipment on their premises

All equipment owned by MLL installed within private property (since 1 Jan 1993), requires an easement. Private property includes, but not restricted to, customer owned land, land owned by Council for reserve/recreation purposes, and land owned by the Crown for school/prison purposes. An easement is registered on a record of title to the land and allows MLL's equipment to legally occupy the area defined by the easement, and provides for MLL to have unobstructed access at all times to its equipment in order to operate and maintain it. Easements also require that there is reasonable unobstructed space around the equipment to ensure safe operation and access to carry out any necessary maintenance and repair work. MLL has standard easement areas required for all types of equipment. For any further clarifications regarding MLL's standard easement requirements, contact MLL on 03 577 7007.

MLL, the customer's Electrical Service Provider and the customer are responsible for their obligations under the Health and Safety at Work Act 2015.

If a customer breaches the conditions of the easement (such as building over the land covered by the easement or obstructing access to the equipment} then the customer may be liable to pay for any remedial work necessary to ensure the conditions of the easement are complied with. It is important that the customer understands the conditions of the easement to avoid breaching the terms. It is also important that when a customer purchases a property with an easement in favour of MLL, that the customer make themselves fully aware of the terms of the easement and their obligations under the easement. Easement conditions and obligations remain on the record of title indefinitely and carry over from the previous owner.

If there is equipment owned by MLL on a customer's property which was constructed before 1 January 1993 (when the Electricity Act 1992 was enacted} then in most cases there will be no need for an easement. In these cases, MLL's right to enter the land to operate and maintain the equipment is very similar to the conditions of an easement. Part 3 of The Electricity Act gives MLL the right to "enter

upon land for the purpose of gaining access to those works and may perform any act or operation necessary for the purpose of inspecting, maintaining, or operating the works". Maintenance is described as repairs and the carrying out of any replacement or upgrade of existing works as long as the land will not be injuriously affected as a result of the replacement or upgrade.

For any further clarifications regarding MLL's access requirements, contact 03 577 7007.

3.6 MLL to inform WorkSafe of electrically unsafe installations

Should MLL or its field service providers become aware that an installation is electrically unsafe, they will notify the owner of the installation and WorkSafe of the situation (refer to Reg 15 of the Electricity (Safety) Regulations). WorkSafe will take any appropriate and necessary actions to ensure safety.

3.7 Planned interruptions

From time to time, MLL may need to temporarily restrict or disconnect a customer's power supply to carry out repairs, maintenance or alteration to the network. These situations are infrequent and where reasonably practical, MLL will seek to minimise disturbance to the customer. Notification of planned power outages will come from your retailer.

4 Information for Customers Modifying their Connections

This section details guidelines for modifying connections to MLL's electrical network.

4.1 Requirements for customers increasing their capacity

If a customer wishes to increase their load an application must be made for the additional capacity needed.

If a new home or business premise is being built at a site where a connection is already established, the existing connection will have been subject to a specified maximum capacity. If the new activity at the site requires either an increase or significant decrease in specified capacity, a new connection agreement will be required.

Customers must lodge the change request before uprating an installation, as this allows MLL to confirm the new installation is compliant and whether or not MLL's network needs to be modified. This is to ensure there is sufficient network capacity and the customer's installation is safely protected.

The customer or the Electrical Service Provider (but not both) can make an application to MLL for the capacity increase. For further details refer to MLL's website.

4.2 Requirements for disconnecting from MLL's electricity network

If a customer wishes to disconnect from MLL electricity network, they must lodge a disconnection request through MLL's website. at Requirements for reconnecting to MLL's electricity network

Requirements for reconnections are subject to Section 74 of the Electricity (Safety) Regulations and may require retesting and inspection. It should be noted that if an installation was disconnected for more than six months, an inspection will be required before it can be reconnected to the network.

5 Technical Design Requirements

5.1 General requirements

While the standard supply to most new consumers will be a single phase, 230-volt, 60-amp LV supply, larger or other special supply requirements can be arranged (for example: three phase 400/230 volt LV supply).

The type of network connection provided for a consumer will be dependent upon the network connection capacity required, the position of the consumer's main switchboard and the location and nature of the consumer's installation.

Before being connected to MLL's network all consumer installations and appliances shall have been designed, constructed, configured, and installed to comply with the requirements of this standard and the following:

- New Zealand Electrical Codes of Practices
- Electricity (Safety) Regulations 2010
- AS/NZS 3000 (Australian/New Zealand Wiring Rules)
- Other standards referenced in this document

5.2 Network Point of Isolation

The network point of isolation is the point at which electricity may flow between the network and the consumer's installation.

A unique installation control point (ICP) means the point at which the Retailer / Trader is deemed to supply electricity to the consumer. The ICP remains with the connection rather than with the customer.

The network point of isolation is determined by the distributor to ensure disconnection (isolation by de-energisation) without affecting the integrity of the network or the conveyance of electricity to any other ICP. It is at the point of isolation that a connection is reconnected (energised) or disconnected (de-energised and isolated from the network).

5.3 Consumer's Point of Supply

The consumer's point of supply is the location in the electrical circuit where ownership of the equipment relating to the supply of electricity changes between the distributor and the consumer.

In some instances, the distributor will own fittings on the consumer's premise that is on the consumer side of the point of isolation. This may include, but is not limited to equipment such as switches, transformers, metering equipment and load control equipment.

5.4 Requirements for Connection of Installations to Network

MLL has rights of access to MLL's equipment installed on a consumers' premises (this is a requirement prescribed in the consumers choice of Retailer / Trader who must have a Default Distributor Agreement with MLL).

Metering data for each ICP will be provided by means of a single meter register or data logger channel for each variable Price Category or Tariff Option (this is a requirement prescribed in the consumers choice of Retailer / Trader who must have a Default Distribution Agreement with MLL).

5.4.1 Urban Areas

Connection capacities up to 3-phase sixty (60) amps are usually available from the LV distribution system. At a few locations connections up to 400 amps can be made direct onto this system.

Connection capacities that are between 100 amps and 400 amps may require the installation of a transformer(s) located on the consumers property for their exclusive supply.

A capital contribution may be required from a consumer requesting a change in capacity.

5.4.2 Rural Areas

In some rural areas the network distribution system consists of two (2) wire HV. In those instances, only LV single-phase 230-volt or split phase 240/480-volt supplies are available.

In these areas the largest capacity connection available without upgrading the HV distribution to a three (3) wire network is 50-kVA single phase. A capital contribution may be required by a consumer requiring an upgrade to three phase supply.

In rural areas the large distances between consumers often requires consumers to be supplied via a shared or dedicated transformer installed specifically for the consumer. Where an existing transformer is situated within 200m of a proposed connection, MLL may require a low voltage extension be installed rather than installing a new transformer. If the proposed connection is further than 200 metres from an existing transformer, a new closer transformer may be required.

This transformer can be located on a pole in the road reserve with the consumer taking supply via LV Electric Line. In situations where the consumer's main switchboard is further than 250 metres from an HV line in the road reserve the most economical solution is usually the installation of an HV line across the consumer's property to a transformer close to the main switchboard. We may require a capital contribution from the consumer.

5.4.3 Unmetered Connections

To qualify for an unmetered supply the load shall be less than one (1) kVA and use less than 3,000 kWh per annum and consist of fixed wired equipment.

Typically, these types of connections are supplies to council owned power supply outlets - e.g. Telco cabinets and council flow meter sites.

Each unmetered connection shall be supplied by a thirty (30) amp HRC type fuse carrier loaded with a ten (10) amp fuse.

5.4.4 Temporary Supplies

Temporary supplies (commonly called *Builders Temporary Supplies*) shall be treated as being a consumer's installation so they shall be located on property owned by the consumer.

They shall be allocated an ICP and metered in accordance with the requirements of Section 8. Sites where multiple temporary LV Supplies are needed require separate ICP's to be established.

Temporary supply power outlets shall not be fixed to MLL's assets.

5.4.5 Electrically Unsafe Installations

ESR Regulation 15(1) Using Works, Installations, Fittings, Appliances, and Associated Equipment states:

> "A person who owns or operates works, installations, fittings, or appliances must not use, and must not allow any other person to use, the works, installations, fittings, or appliances if the works, installations, fittings, or appliances are electrically unsafe."

MLL will contact the Retailer / Trader to authorise the disconnection of an electrically unsafe installation from the network if the owner fails to do so.

5.5 Supply capacity

All connection applications and capacity upgrade requests will be checked to confirm the requested supply capacity is available in MLL's network. Connection applications, variations to existing supplies or additional information may be submitted through MLL's website.

5.5.1 Residential

Most permanent residential connections can be adequately supplied from a sixty (60) A single-phase connection from MLL's LV distribution network via distribution pillars. For power requirements in excess of this, a 60A three-phase supply, 100A single or three-phase supply may be needed.

When assessing the supply requirements of an installation, consideration must be given to the following.

- The fault rating of the equipment that will be used on site. Any electrical equipment or protection devices must be capable of withstanding the fault currents to which it is exposed.
- The actual load that is to be supplied. While adding up the power requirements of all appliances offers an assessment of the potential total demand, not all equipment will be operating at the same time. The ratio between installed load and actual demand is called "diversity factor". AS/NZS 3000 Appendix C outlines the methodology for assessing diversified demand of an installation. When assessing the capacity requirements for the installation, MLL is interested in the "diversified" load. Prudent headroom should be made for future load increases while taking into consideration improvement in efficiency for new appliances. Oversizing the installation will result in unnecessary costs to the customer.
- Voltage drop is normally not an issue in urban areas. There may, however, be occasions when customers situated at the end of distribution lines - e.g. down long right of ways - experience excessive voltage drop. Conductors of adequate sizes must be used to prevent excessive voltage drop.

5.5.2 Commercial and Industrial

Applications for commercial and industrial connections or capacity upgrades are individually assessed to ensure the capacity request is reasonable and is available from MLL's existing network. Customers can lodge a query through MLL's website.

If insufficient capacity is available, a network upgrade will be required. The assessment process follows these steps.

- A review of the capacity available from MLL's existing LV network
- Upgrading MLL's LV network to deliver the capacity
- Consider HV options including installation of a substation to meet demand.
- Consider HV options including construction/upgrades of power lines or cables.

The assessment will need to take into consideration load diversity AS/NZS 3000 Appendix C outlines the methodology for assessing diversified demand of an installation. While dependent on the assessments above, as a general guide, diversified load over 100kVA could be a candidate for a new transformer. MLL will evaluate that the options are technically acceptable. The customer should note that if the diversified demand has been over-estimated resulting in larger than necessary equipment being installed, the customer will be required to bear the cost of downgrading.

Where a new transformer is required, MLL may require the customer to provide a site for the substation within their property. When a site is required on the customer's property, an easement in favour of MLL will be required, in addition to clear and unobstructed access at all times to the substation for operations and maintenance.

5.5.3 Congestion and Capacity Constraints

5.5.3.1 General

In the Kenepuru Sound, beyond Mahau Peninsula and on the single or three phase 11kV network, we can now only permit new single phase thirty (30) A connections.

In the Wairau Valley, beyond 1294 State Highway 63 we can no longer permit additional irrigation load. This includes new connections or upgrades to existing connections. If you would like to connect irrigation load in this area please still let MLL know. We are investigating options to increase capacity and once we have a solution will be able to remove/modify this restriction.

5.5.3.2 SWER Networks

SWER Networks were designed to be low capacity, long radial distribution lines. In order to reduce the risk of exceeding EPR limits MLL does not permit more than 100 kVA of diversified load on an isolating transformer supplying a SWER network. In several areas across our network we have reached this capacity limit on our SWER networks and can no longer accept additional connections. Applications to connect to SWER networks will be assessed on a case by case basis. If there is available capacity the maximum size connection will be single phase thirty (30) A.

5.5.3.3 Extreme Remote Areas

No new connections or upgrades of existing connections are permitted in our “extreme remote” areas. These areas are defined on our website under the pricing section on the “remote areas map”.

5.6 Overloads and Protection Requirements

5.6.1 General

For consumers supplied via a LV fuse, the connection capacity is generally determined by the protection rating of the service fuse. If the consumer’s load exceeds the protection rating, protection operation can result.

MLL provides protection on its network and at the Point of Supply to the customer against fault situations. It is the customers' responsibility to provide protection against faults or overloads that may occur on their installation.

To ensure the safety of personnel and property, the customer must have electrical protective device(s) on their switchboard that will:

- protect the installation against overcurrent situations
- ensure any overcurrent protective device discriminates with MLL’s protection.
- clear any electrical faults within their installation before MLL’s protection devices operate.

Depending on the situation, the protection may be afforded by a fuse or a protective device integrated into a circuit-breaker. For residential situations, the protection is generally provided by a 63A high rupturing capacity (HRC) fuse.

For larger capacity installations, the protection may be built into the mains circuit-breaker.

Where the customer's primary electrical protection is contained within a circuit-breaker, then the protection controlling the circuit breaker must configured to:

- ensure the protection will operate to prevent the customers' equipment, including cables, from overloading
- ensure MLL’s transformer is not overloaded
- discriminate with MLL’s upstream protection
- ensure the short-circuit rating of the customer's electrical equipment is not exceeded.

Customers supplied from dedicated transformers require their protection to operate at an overcurrent limit no more than the electrical capacity of the transformer. The customer's load must not exceed the rating of the transformer. MLL may review the customer's protection schemes from time to time to ensure safe operation of MLL’s equipment.

5.6.2 HV Network Protection

For consumers supplied via HV fuses the connection capacity shall comply with the requirements of MLL’s *DN002 Network Fuse Protection Standard*.

In order to ensure satisfactory operation of MLL’s and the consumer’s protection systems, operating times, discrimination, and sensitivity at the point of supply shall be agreed between MLL and the consumer. These settings may be reviewed by us from time to time.

5.7 Multiple Connections and Isolation

5.7.1 General Requirements

If there is more than one ICP at or upon any consumer's premises, no interconnection shall be made between those connections at any time.

In all cases, each ICP shall be able to be separately disconnected (de-energised) from the network without affecting the electricity supply to any other ICP's present upon the same property.

If the consumer has more than one point of supply to the network when there are multiple ICP's present at the same premises, the consumer shall not parallel or tie the installations or install any facilities that allows those ICP's supplies to be paralleled. This is to avoid the possibility of back feeds creating potentially hazardous situations on the MLL network.

Where a developer is creating multiple connections on a common property, the following conditions shall apply:

a) Between two (2) and five (5) connections on a common property are to be individually fused at the MLL network connection point, with separate service mains.

b) Greater than five (5) tenancy connections per lot, building or apartment, shall have a fused LV service box (or LV cabinet if not enough space in a service box with a single three phase fuse disconnect unit, with internal reticulation and fusing.

5.7.2 Multiple Tenancy Installations

Multiple tenancy installations – one building that has a single point of connection to the MLL network, with multiple tenancies that are individually metered. Each tenancy will be separately isolatable and have its own ICP.

All applications for multiple tenancy installations shall be submitted to MLL with the following information:

- The capacity of each tenancy (number of phases and amps) and the nature of the proposed connection (residential, retail shop, food outlet, commercial, storage unit)
- A single line diagram showing the proposed fusing and electrical layout at the tenancy isolation point, verifying that each connection can be separately isolated
- A site / building layout plan, with clarification on how the individual isolation points will be accessible to MLL
- Information on which MLL approved contractor will be verifying the internal fusing capacity and isolation points arrangement prior to livening
- For commercial / industrial sites, the capacity at the MLL network connection point shall not be greater than the net sum of the individual tenancies. This applies to sites connected to the LV network and those connected to a transformer that is dedicated to that site.

5.8 HV Connections

Connection of any HV installation to MLL's electricity networks shall comply with the requirements of the *ESR* which are described in the EEA *Guide for the Connection of High Voltage Electrical installations,* shall be verified in accordance with the guide, and a verification Statement provided by the consumer that the installation is electrically safe and complies with the regulations.

Any consumer can take supply at HV, but it is generally only economic for capacities in excess of one (1) MVA or when the consumer has a special need for an HV supply.

Typical configurations for HV network connections will be via an incoming isolation device such as dropout fuses, circuit breaker, isolating switch, or fuse switch. The incoming isolation device will be supplied and maintained by MLL, but the consumer shall provide suitable accommodation for this equipment.

5.9 Earthing

Customers' earthing systems must be designed and installed in accordance with AS/NZS 3000. MLL's earthing in its network is designed and constructed to MLL's standards DN010, ECP 35, and ESR.

It should be noted that New Zealand adopted a Multiple Earthed Neutral system of supply. The customer is required to install their own main earthing system in accordance with the requirements as set out in section 5 of AS/NZS3000.

The customers earthing system shall not be connected to MLL's earthing system and 5m (in ground) separation shall be achieved.

5.10 Easements

If MLL's equipment is located on private property, the landowner must grant MLL an easement on MLL's Standard Terms and Conditions covering the space in which MLL's equipment is situated and access to equipment by MLL personnel to enable MLL to carry out its operation, maintenance and repair works.

MLL's equipment located on private property must always have clear and unobstructed access for operation, maintenance and repair purposes.

5.11 Fault Level Considerations

For business and industrial customers connected to dedicated transformers, the prospective short circuit current for the respective installation is predominantly determined by the size and impedance of the transformer. Typical prospective short circuit currents at the LV terminals of the different sizes of transformer used in MLL's network are published in *Appendix A - Fault Level*.

Customers should ensure that their installation is sized to operate safely with these prospective short circuit currents and protective devices are correctly configured to provide the necessary protection discrimination.

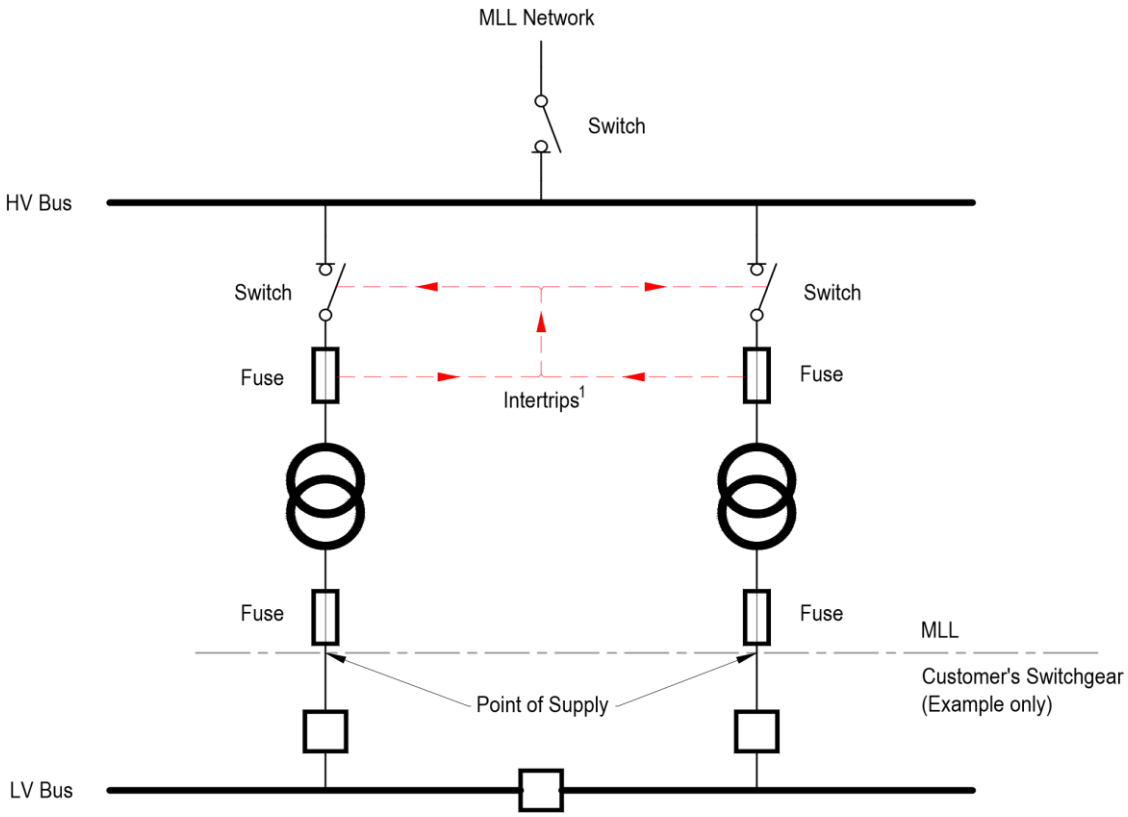
5.12 Parallel operation of transformers - Commercial/ Industrial

MLL does not recommend parallel operation of transformers as this will increase prospective short circuit currents in the customer's installation and create complexity in equipment protection.

Parallel operation of a transformer does not improve the security of supply to the installation, as the probability of failure of circuits supplying the transformer far exceeds that of the transformer. The effect of having multiple transformers supplying a site is to increase the capacity of supply. The increase in supply capacity can be achieved without having to operate the transformers in parallel.

If the customer requires the MLL-owned transformers to be operated in parallel, the only configuration acceptable to MLL is for two transformers to form a group as follows:

Figure 5-1 Dual TX Connection Configuration Example



[1]Intertrips are required between the fuse and isolation switch on each transformer feed. For faults that operate the HV fuse, all transformers must isolate to prevent a back-feed fault on the HV cable.

If more than two transformers are required, more groups of two will be required. We may require a HV circuit breaker in certain configurations to ensure adequate protection of multiple transformer sites.

Alternatively, the customer may choose to own their transformers and arrange their own protection schemes.

If the customer requires enhanced security, they need to discuss this with MLL as the solutions will be site specific.

5.13 Trees Near Lines

For safety reasons, consumers shall ensure that the trees and shrubs on their property are kept well clear of all overhead power lines. Where trees or shrubs may cause safety concerns, MLL may temporarily disconnect power to the consumer and contact the consumer's electricity Retailer/Trader to follow up on remedial actions that ensure the long-term durability of our network.

MLL's website provides guidance on how to avoid power outages through the management of trees near power lines. The site also provides a list of MLL approved tree contractors.

5.14 As-built Process

All additions, deletions, and modifications to MLL's network assets shall be provided to MLL's Network Graphical Information Team in accordance with the provisions prescribed in our *CN004 – As-built standard*.

5.15 Generators

Applications for the connection of generators to MLL's network either directly (such as a standalone wind generator) or via the customer's installation (such as rooftop solar panels) can be made via MLL's website.

For generators that are designed to synchronise or operate in parallel with MLL's network and have the ability to export energy, the customer must apply to MLL before connecting the generator. These must comply with our distributed generation connection standards at the link above.

These generators include, but are not limited to solar panels, wind generators or diesel generators.

Generators that cannot be connected to and synchronised with MLL's network (such as backup generators) are not required to go through the generator connection application process.

5.16 Battery storage systems

MLL must consent to the installation of any batteries that may export power while connected to MLL's network (even if the customer does not intend to export) prior to installation. Applications for connection of such batteries can be made via MLL's website.

6 Technical Requirements for Installations (Power Quality)

To preserve the quality of electricity supplied, customers must not use equipment or appliances that would unduly interfere with the satisfactory supply of electricity or impair the safety or operation of equipment and appliances of other customers. This section contains the standards customers' equipment and appliances are required to comply with.

Customer power quality must comply with all relevant NZ Electricity Regulations, NZ Electrical Codes of Practice and AS/NZS 61000 series of Standards and Technical Reports.

Where AS/NZS 61000 series references are inadequate, then customer power quality must adhere to IEC 61000 series of Standards and Technical Reports. The EEAs (Electricity Engineers Association of New Zealand) Power Quality (PQ) Guidelines may be used as a guide.

If a customer's equipment causes excessive power quality disturbances, the customer may be required to bear the remedial costs.

6.1 Load Power Factor

The power factor of a customer's load measured at the meter shall not be less than 0.95 (lead or lag). MLL may require a customer to provide necessary corrective measures, such as power factor correction, at their own expense, if the power factor falls outside the 0.95 lead/lag limits.

6.2 Voltage Fluctuations

Voltage fluctuations and flicker due to any load or equipment (e.g., motor starting, motor operation, sudden switching of large loads or equipment, operation of electrical arcing equipment such as welding machines or arc furnaces, etc) must comply with:

- AS/NZS 61000.3.3 Electromagnetic compatibility (EMC) Part 3.3 Limits - Limitation of voltage changes, voltage fluctuations and flicker in public LV supply systems, for equipment with rated current less than or equal to 16A per phase and not subject to conditional connection.
- AS/NZS 61000.3.5 Electromagnetic compatibility (EMC) Part 3.5 Limits - Limitation of voltage fluctuations and flicker in LV supply systems, for equipment with rated current greater than 16A.
- AS/NZS 61000.3.7 Electromagnetic compatibility (EMC) Part 3.7 Limits - Assessment of emission limits for fluctuating loads in MV and HV power systems.

MLL may require a customer to implement corrective measures to limit the level of distortion, at their own expense, if their equipment does not comply with the above requirements. Under exceptional circumstances, MLL may consider other limits or levels.

6.3 Motor Starting

The starting of electric motors can cause severe voltage dips on the network resulting in irritation to other consumers.

Motor starting limitations are summarised in the following paragraphs.

6.3.1 Exempt Motor Sizes

AC motors up to and including the ratings listed in the following table are not subject to starting current limits and may be started direct on line without specific permission to connect.

Table 1 Exempt Motor Sizes

Motor Type	Motor Rating (kW)		
	Rural	Urban Residential	Urban Non-Residential
Single Phase	0.75	1.5	2.2
Three Phase	4.0	4.0	7.5

6.3.2 Non-Exempt Motor Sizes

The criteria used for approval of non-exempt motors is that the relative voltage changes on motor start-up shall not cause voltage fluctuations in excess of the compatibility limits specified table below.

Table 2 Allowable Relative Voltage Change

Frequency of Starting	At Point of Supply	At Zone Substation
Standby equipment started very infrequently	6%	2%
Not more than three (3) starts per day including not more than one (1) start between the hours of 5pm and 11pm on any day	6%	1.5%
In excess of three (3) starts per day but not more than ten (10) starts per hour	3%	1.0%
In excess of ten (10) starts per hour	1%	0.5%

6.3.3 Multiple Motor Installations

In installations where several large motors start automatically, the effect of these motors starting simultaneously when supply is restored after a power interruption needs to be considered.

Should several motors on a consumer's installation start automatically when supply is restored after an interruption, then unless delayed starting is installed to the satisfaction of MLL, the relative voltage change will be assessed on the basis of all motors on automatic control starting simultaneously.

6.4 Harmonics

Harmonics shall be managed in accordance with the EEA publication Power Quality (PQ) Guidelines.

To limit the effects of voltage waveform distortion and other disturbances on MLL's network caused by certain types of customer equipment, the customers' load must comply with the following.

- Voltage and current waveform distortion must comply with the limits set out in all relevant Regulations, Rules, Electrical Codes of Practice and 61000 series joint Australian / New Zealand EMC standards.
- The voltage and current waveform distortion by any load or customer installation must comply with:
  - NZECP 36 Harmonic Levels
  - AS/NZS 61000.3.2:2007 Electromagnetic compatibility (EMC) Part 3.2 Limits - Limits for harmonic current emissions (equipment input current less than or equal to 16 A per phase)
  - AS/NZS 61000.3.4 Electromagnetic compatibility (EMC) Part 3.4 Limits - Limitation of emission of harmonic currents in low voltage power supply systems for equipment with rated current greater than 16 A
  - AS/NZS 61000.3.6 Electromagnetic compatibility (EMC) Part 3.6 Limits - Assessment of emission limits for distorting loads in MV and HV power systems.

6.5 Signalling

The network shall not be used for the purpose of conveying signals unless express and prior written approval is given by MLL.

Should the consumer use their own electrical installation to convey signals, MLL will not provide any warranty as to the electrical characteristics or signalling properties of the network, or the network's capability or suitability in that regard. The signals shall not cause any interference or damage to the network or to other consumers connected to the network, and the consumers shall be responsible for installing suitable blocking filters to ensure signals do not interfere with the network or other consumers installations.

6.6 Unbalanced Loads

All polyphase loads connected to the network shall be evenly balanced across all phases of the distribution network as can be practically achieved.

6.7 Capacitors

Capacitors are generally installed in customer installations to provide power factor correction. They can be part of a power factor correction unit or associated with individual appliances such as motors or fluorescent light fittings. Where capacitors are installed, they must meet the following requirements:

- Customers are allowed to install unblocked capacitors with a kVAr capacity of up to 2% of the connection kVA capacity.
- Capacitors that have a kVAr capacity that exceeds 2% of the connection kVA capacity must have suitably rated blocking chokes on the network side of the capacitors or group of appliances containing capacitors.
- For 3-phase connections the maximum kVAr per phase is one-third the total kVAr allowed.

Capacitors connected to customer premises must not interfere with the propagation of ripple load control signals transmitted over MLL's network. These frequencies are 1050Hz and 217Hz.

6.8 Load Control

The purpose of controllable load is to minimise constraints on MLL's distribution system and the electricity transmission system.

The system relies on consumers electing to connect some types of load in exchange for a cheaper electricity rate. Load control equipment permits MLL to respond to system emergencies as and when they arise on our distribution network and / or on Transpower's grid by controlling that connected load.

All installations that use control load systems shall be fitted with an individual approved ripple receiver (relay) that is capable of being controlled by MLL's load control system. The load must be hardwired to the control circuit so that the customer cannot swap the load to a different outlet during control periods.

6.8.1 Suitable Interruptible Loads

All interruptible loads should be able to deliver satisfactory service when being controlled under MLL's normal load management strategies.

Interruptible Loads that commonly fit these criteria include:

- Electric water-heater of between 100 to 500 litres storage capacity and fitted with a heating element of 1.5 kW or more.
- Mode 3 EV chargers ranging from 3.0 kW to 7.4kW single phase. Larger three phase EV chargers may also be considered for load control on a case by case basis with MLL.

Should a consumer choose not to have any of the above appliances controllable, the consumer shall pay the appropriate price category or tariff option (i.e., the consumer shall be ineligible for a controlled price category or tariff option).

MLL may switch other loads than those listed above for the purpose of minimising network constraints in accordance with specific contracts with the consumers Retailer / Trader. Please contact us if you have a large load (e.g. irrigation, bulk freezer/chiller, air conditioning etc) that MLL could control in return for a cheaper electricity rate.

MLL may also control load at its discretion for purposes other than minimising network constraints in accordance with specific contracts with individual consumers.

Where advanced metering is installed, the unit shall either have, or be installed, in conjunction with a ripple receiver or other receiving device, capable of receiving a ripple control signal from the distributor.

A residential consumer will be allocated to the relevant, or consumer elected controllable tariff as appropriate by their electricity Retailer/Trader.

7 Technical Criteria – Service Connections

7.1 LV Connections

Connection of service lines to premises/installations, both in the case of new work and in the case of disconnection/reconnection for any purpose, shall comply with:

- ESR, including (but not limited to) Regulations contained in Part 5 Safety of Installations.
- ESR, Regulation 38 Testing works before connecting to supply.
- The EEA Guide for Livening of Service Connections to Premises.

In urban areas, new residential service connections will be via an underground cable from a service pit or pillar located at the front boundary of the property, or where MLL's network is overhead, the service cable may be terminated onto a pit or pillar supplied from the overhead line. In rural areas, service connections are assessed on a case-by-case basis.

7.1.1 Neutral Size

All Service Line neutral conductors should be the same size as the phase conductors. This will reduce the chance of neutral conductor overloads due to unbalanced loads and harmonics.

7.1.2 Overhead LV Service Lines

In rural areas, new connections may be made via overhead service lines using existing overhead distribution network at the property boundary.

Unless an alternative arrangement is made with MLL (in writing), lines and poles beyond the Point of Supply on the customer's premises are the responsibility of the customer. For LV residential service lines, this includes the connection fittings onto the house.

The overhead connections to MLL's poles must not impose forces beyond what the pole can safely withstand. Guidelines for this are contained in Appendix D of AS/NZS 3000. For more detailed information parameters for connecting to MLL's overhead lines, contact MLL.

MLL requires that all phase conductors of LV overhead lines, including the neutral within the customer's premises, are insulated. An LV neutral-screened service cable should be used for enhanced safety.

Clearances of overhead run electric lines run in the road reserve shall comply to the heights prescribed in MLL's *DN007 Network Overhead Line Design Standard* and to the requirements of ECP 34 and AS/NZS 3000 where the electric line runs above the consumers property.

Earthing arrangement must be installed to meet the requirements specified in Section 5 of AS/NZS 3000.

7.1.3 Underground LV Service Cables

All new connections in residential areas are to be made by underground service cables via MLL's boxes or pillars. The service cable from the Point of Supply to the customer's main switchboard is owned by the customer.

Cables laid in road reserves (the national transportation corridor) are required to be plotted to sufficient accuracy for future location in accordance with the requirements of The National Code of Practice for Utilities' Access to the Transport Corridors and those details shall be provided to MLL in accordance with requirements of *CN004 As-Built Standard*.

Both MLL and other infrastructure service providers operate cable locating services.

MLL requires that all service/distribution electric lines shall be buried to the depths and maintain clearance to other services as prescribed in MLL's *DN008 Network Underground Cable Design Standard* for works in the road reserve and to the requirements of AS/NZS 3000 where the electric line is laid within the consumers property.

Earthing arrangement must be installed to meet the requirements specified in Section 5 of AS/NZS 3000.

Where MLL will take ownership of a cable it shall be one of our approved cable types as prescribed in MLL's *DN008 Network Underground Cable Design Standard*

7.1.4 Service boxes

Service boxes allow the connection of customers' service cables to MLL's low voltage network. They are designed and installed by an MLL approved contractor.

In residential areas, the service boxes are generally placed on the street frontage at the junction of two adjacent properties allowing the pits or pillars to service several customers.

Where a subdivided Lot is more than 10 meters from an existing service pit or pillar, a new service pit or pillar will need to be established at the property boundary.

The connection of LV Service cables into service boxes will be physically undertaken either by MLL or by an MLL approved contractor.

The consumer is responsible for the fitting of any electric line tails and for the provision of suitable cable lugs. We only permit certain cables types and sizes to connect to our network so please consult MLL during your design.

7.2 Large Connections and Substations

For a very large load, such as that for a commercial/office complex or industrial building, a dedicated supply is often required. For loads larger than 150kVA, a substation may be required in order to connect to the 11kV distribution network to provide the necessary capacity for the customer.

LV service cables will be installed by the customers electrical service provider from the LV end of the transformer (or other network connection point) to the customer's main switchboard. These cables need to be suitable for connection to our switchgear so please consult MLL early during the design phase to determine if they are suitable. We have limits on the number of cables per phase and their sizes for example.

The Electricity Retailer's inspector will install the revenue metering system, inspect the installation and issue a record of inspection before the MLL-authorised contractor terminates the cables to the transformer LV fuse and livens the supply. Note that in this situation, the Point of Supply is at the connection of the service cables to the transformer's LV fuse.

When it is necessary to install a transformer on a consumer's premises, the consumer shall make available on the consumer's premises suitable space to accommodate the transformer, HV cable or lines, associated switchgear, and metering equipment. MLL's equipment accommodation requirements are prescribed in the below mentioned design and construction standards.

The consumer shall also grant an easement in MLL's favour on MLL's Standard Terms and Conditions to facilitate its unrestricted access to all the equipment and fittings that are associated with the

conveyance of electricity to both the consumer and any other consumers. All easements shall comply with the requirements of DN004 Network Easement Standard. MLL's property team shall always be involved in the preparation of those agreements.

Substations shall comply with the requirements of MLL's DN009 Network Substation Design Standard.

All substations and HV circuits on the consumer's property shall be designed by MLL and constructed by MLL or an approved contractor.

In addition to any requirements prescribed in the above the connection of any HV installation to MLL's Electricity Networks shall also comply with the EEA Guide for the Connection of High Voltage Electrical Installations.

7.2.1 HV Connections

Some large customers may prefer to own the transformers supplying their premises. In those cases, the customers will receive supply at 11kV.

MLL will install a new HV switchboard (or ring main unit (RMU)) close by the customer's premises and install an HV cable to supply the customer's transformer on the customer's premises. If there is more than one transformer on site, the customer will install and own an HV switchboard to connect their transformers.

The MLL-owned switchboard (or RMU) will form an integral part of the distribution network. It will provide protection for HV faults in the customers network, either via a fuse or circuit breaker. If the MLL-owned equipment is located inside the customer's premises, an easement in MLL's favour will be required.

The connection of cables to the MLL-owned switchboard (or RMU) will be carried out by MLL's field service providers. All work downstream of the customer-owned switchboard or transformer connection point will be the responsibility of the customer. The Electricity Retailer will arrange installation of the revenue metering system upon satisfactory inspection of the installation by their own inspector. MLL's field service provider will liven the HV connection upon receipt of the CoC, ESC and ROI of the installation.

It is important that the customer's HV consultant coordinates the protection settings of the installation with the settings of MLL's network to ensure safe and efficient operation of the network and the customer's installation. MLL will coordinate the protection settings within its network and with Transpower's national grid.

8 Metering

Each ICP must be metered for revenue purposes. Metering must be arranged through the customers' chosen Electricity Retailer. Metering must be kept within the customers' installation, not on MLL's equipment.

8.1 General Requirements

Metering Equipment is to be provided in accordance with requirements of MLL and the consumers electricity Retailer/Trader, and:

a) MLL's preference is that the metering arrangement shall not rely on summated meter readings from multiple meters on the consumer's premises

b) Load and generation flow volumes shall be measured and reported separately – i.e. net metering is not acceptable

c) Metering by subtraction is not permitted

d) Must comply with the protection and isolation requirements of section 5

e) All connections over 3000 kWh per year shall be metered.

8.2 Meter Location

8.2.1 Residential

Electricity meters must be outside and positioned on the front of the building or structure facing the road or access way, or on the sides of the building immediately adjacent to the front. It must be easily and directly accessible from the road or access way.

There must be no fences, walls, obstructions, prickly plants, excessive vegetation, dangerous animals or other hazards that restrict access to the meter box. The meter enclosure needs to be weatherproof and secure from unauthorised entry or interference.

If there are hazards or entry restrictions to the property, the meter should be installed at an accessible location e.g the front boundary.

8.2.2 Commercial or multi-dwelling

The meter should be installed outside as with residential installations, however it may be located inside the building if there is no suitable outdoor location. It should be secure and safe from damage and able to be easily read.

Indoor meters must be easily accessible during working hours and should not pass through hazardous, restricted or hygiene (e.g. food preparation) areas. A key should be provided or access arrangements made.

High rise or multi-tenanted buildings should have all the meters located in a central area.

8.3 HV Metering

For metering large quantities of energy, the preference is to use LV metering instead of HV metering which can be installed on the customers' main switchboard.

Where HV metering is unavoidable, the HV metering unit must be installed separate from MLL's HV switchboard. Any HV metering system must be arranged through the Customers' chosen Electricity Retailer. The customer should raise the prospect of HV metering at the earliest stage of the development with the Electricity Retailer. All costs associated with the HV metering unit, including but not limited to initial capital cost, ongoing maintenance and recalibration and end-of-life replacement are solely the customer's responsibility.

8.4 Unmetered supplies

The Electricity Retailer may accept unmetered supplies for some specialist installations such as street lighting and phone booths where electricity consumption is generally low. Consumption will be billed on an estimate basis.

8.5 Metering Required by MLL

MLL may install an additional set of metering equipment at or after, any consumer's point of supply for checking and distribution network management purposes. Consumers shall provide appropriate space within their premises to accommodate MLL's metering equipment.

9 Streetlighting

9.1 General

Streetlighting is normally owned by and are the responsibility of the local council.

Each streetlight site/position is regarded by MLL as an electrical installation as defined in AS/NZS 3000 Wiring Rules.

9.2 Connection to MLL Network

Connection of streetlights to MLL's electricity networks shall only be undertaken by MLL or MLL approved contractors.

Each streetlight pole/column shall have a switchboard. The connection point shall be the supply side fuse terminal at the switchboard.

Streetlights shall be directly connected to MLL's electricity networks by a single core cable. Streetlight cable sizes approved for use are prescribed in *DN008 Network Underground Cable Design Standard.*

Each individual streetlight luminaire shall be supplied from a dedicated streetlight circuit protected by its own fuse holder fitted with an HRC fuse (maximum of thirty-two (32) amps per phase).

Where more than one (1) streetlight is supplied from an LV network connection, the number of streetlights supplied shall be limited to the load capacity of the cabling. A pilot wire installed in the main LV distribution cable will be looped into each service box for streetlights to connect to. A tail will need to be run from each streetlight to the nearest service box. Alternatively, the streetlight supply cable shall be looped in and out of each streetlight pole/column.

9.3 Streetlight Column Wiring and Earthing

A switchboard shall be installed inside the streetlight column at a height not lower than 300mm above finished ground level. The switchboard shall meet the requirements of AS/NZS 3000 Wiring Rules and be equipped with a neutral bar, earth bar, and HRC fuse.

The neutral and earth bar shall be linked with a removable link.

9.3.1 Streetlight Earthing

Each streetlight pole/column shall be earthed by means of a 6mm^2 copper insulated earthing conductor connected to an earth electrode. The earth electrode shall be 13mm diameter copper clad steel. The earthing conductor shall be connected to the earth electrode in accordance with MLL's *DN010 Network Earthing Standard.*

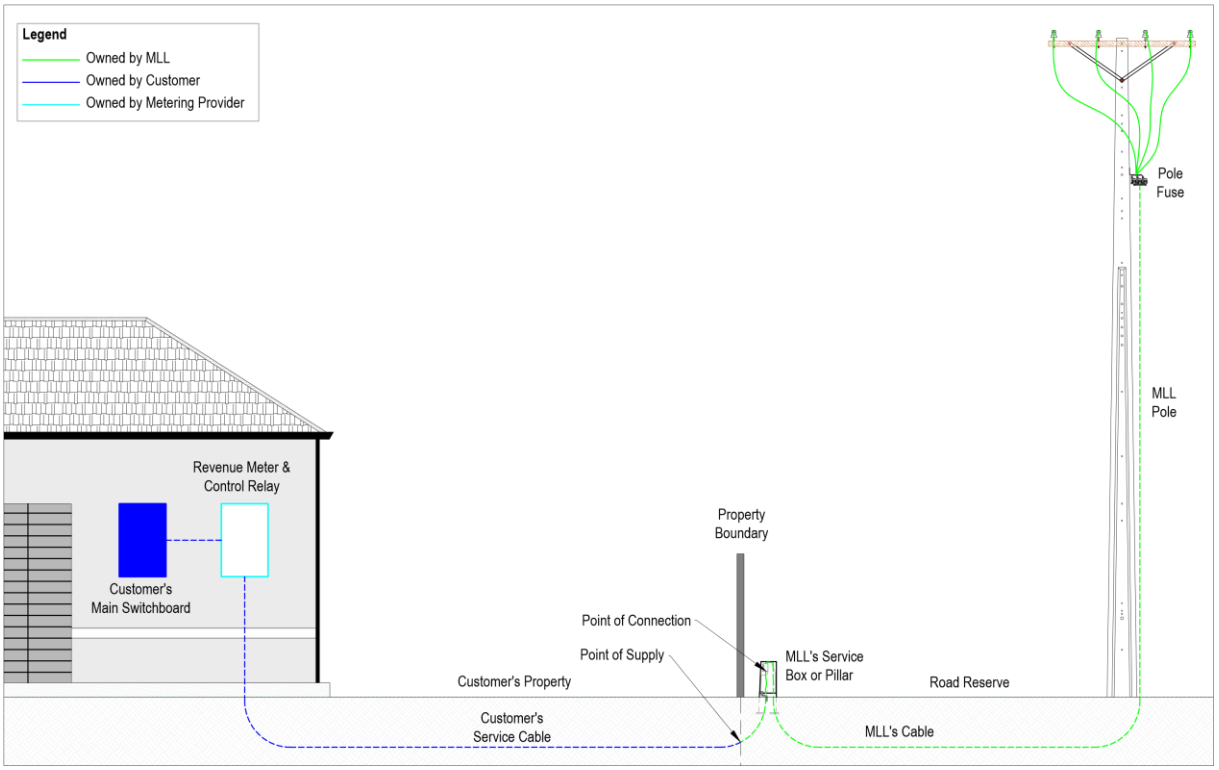
10 Network Connection Configurations

This section describes the different types of configurations new customers can connect to the MLL network.

10.1 Configuration A - Underground residential connections

New supply connections in residential areas must be made via service box or distribution pillar. The following diagram shows a typical new residential supply connection.

Figure 10-1 Typical underground connection asset ownership



The customer is responsible for the construction and maintenance of their installation up to the Point of Supply (POS).

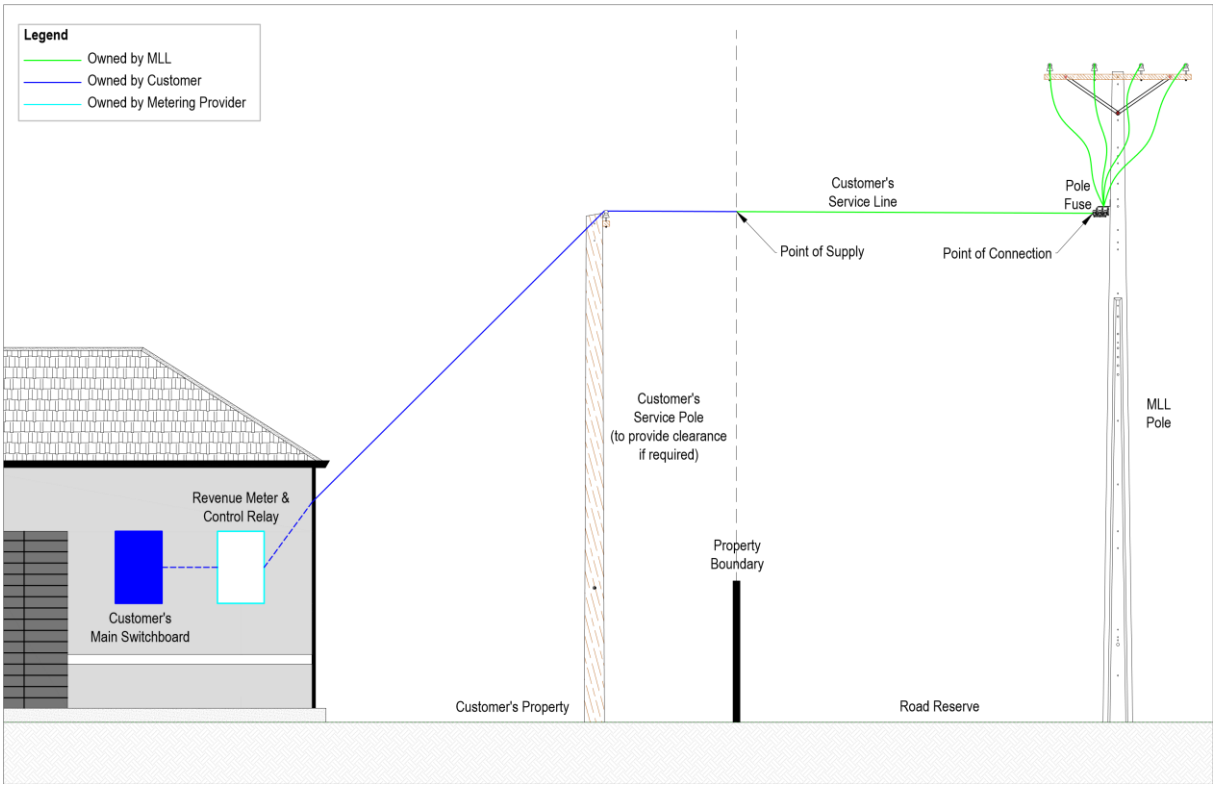
Customers must be familiar with their obligations as detailed in section 3 of these Standards.

Electrical Service Providers must understand the technical requirements in Section 5 of these Standards and how this applies to the customer's installation.

10.2 Configuration B - Overhead residential connections for Rural areas

Overhead supplies for new connections are only allowed in rural areas, excepting where the Marlborough Environment Plan does not allow for it. The following diagram shows a typical rural new supply connection.

Figure 10-2 Typical overhead connection asset ownership



- The customer is responsible for the construction and maintenance of their installation up to the Point of Supply (POS).
- Customers must be familiar with their obligations as detailed in section 3 of these Standards.
- It is strongly recommended to regularly inspect the condition of all external conductors and connections that the customer owns (the inspection must include any poles the customer may own). This is to ensure this equipment is in a good working condition and meets the clearance requirements of ECP 34, particularly checking clearances of vegetation near the lines. The customer should discuss these requirements with their Electrical Service Provider as well as any other maintenance required on their installation.
- The customer should discuss with their Electrical Service Provider the required provisions for activities that require approaching overhead lines. Activities that risk encroaching the minimum approach distances stated in ECP 34 may require MLL to de-energise the installation prior to the activities commencing.

Electrical Service Providers must understand the technical requirements in section 5 of these Standards and how this applies to the customer's installation.

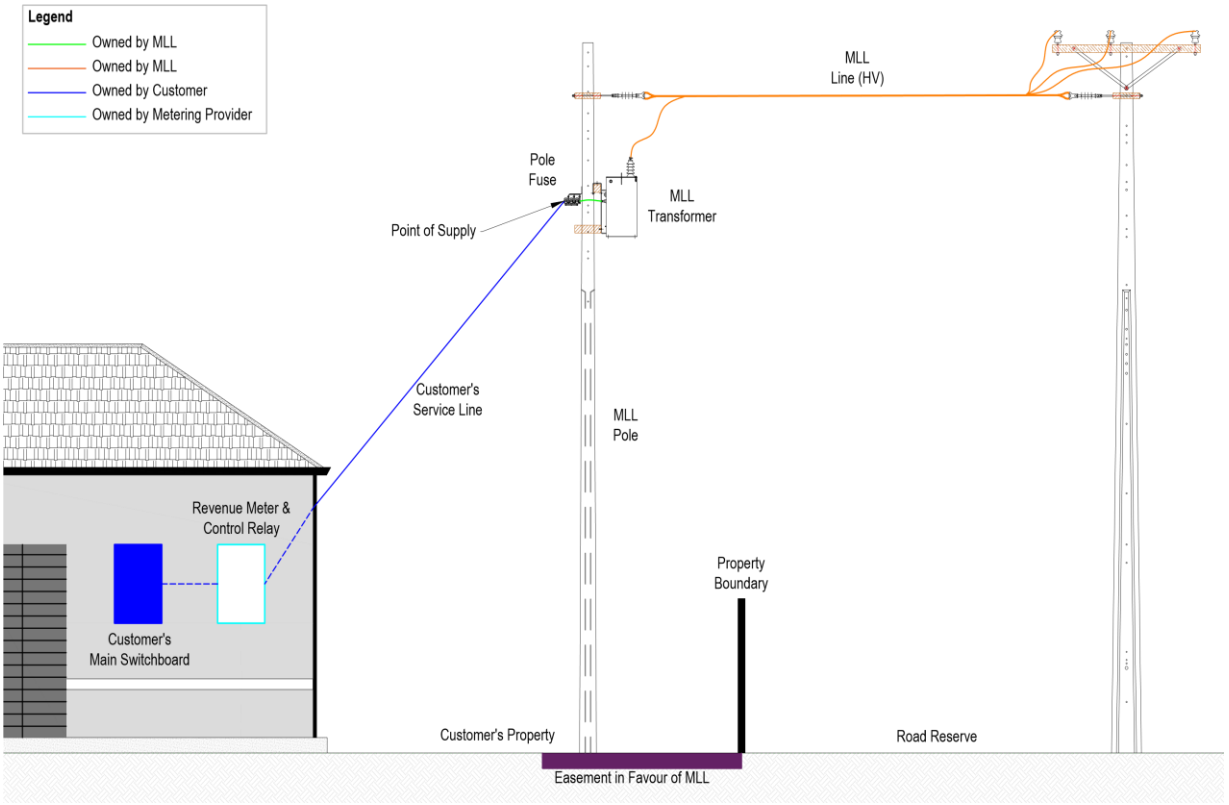
- The Marlborough District Council Proposed Environment Plan requires:
  - New connections to be made via underground cables in residential areas.
  - Rural connections may be either underground cables or overhead lines.
- Poles may be required to be installed on the customer's property to meet the safe electrical clearance requirements of ECP 34. Any poles installed on the customer's property without an easement (including property which is shared with other property owners such as a right or way) are owned by the customer. The customer is responsible for the installation, repairs and maintenance of them.
- Electrical Service Providers must ensure that overhead conductors and poles are designed in accordance with AS/NZS3000 section 3.12.
- Electrical Service Providers must ensure that the mechanical forces from the connections to MLL's overhead line do not compromise the stability of the pole and are designed in accordance with AS/NZS3000 section 3.12.

- A transformer may be required to be installed on the customer's property to meet the requirements of AS/NZS3000 section 3.6. For these requirements refer to configuration C.

10.3 Configuration C - Long overhead connections for rural areas

In some situations where electricity supply is required at a long distance from the property boundary, connection from MLL's LV network may not be practical due to excessive voltage drop. The practical solution is to connect the new supply via an HV line and a transformer, as shown in the diagram below.

Figure 10-3 Typical HV overhead connection asset ownership



- The customer is responsible for the construction, maintenance and repair of their installation up to the Point of Supply (POS).
- Customers must be familiar with their obligations as detailed in section 3 of these Standards.
- It is strongly recommended to regularly inspect the condition of all external conductors and connections that the customer owns (and poles if the customer owns any). This is to ensure this equipment is in a good working condition and meets the clearance requirements of ECP 34, particularly checking clearances of vegetation near the lines. The customer should discuss these requirements with their Electrical Service Provider as well as any other maintenance required on their installation.
- The customer should discuss with their Electrical Service Provider the required provisions for activities that require approaching overhead lines. Activities that risk encroaching the minimum approach distances stated in ECP 34 may require MLL to de-energise the installation prior to the activities commencing.

The customer must always provide unrestricted maintenance access to MLL's equipment as per the easement conditions. For connections made before 1 January 1993, MLL's access rights are provided by the Electricity Act 1992, section 23.

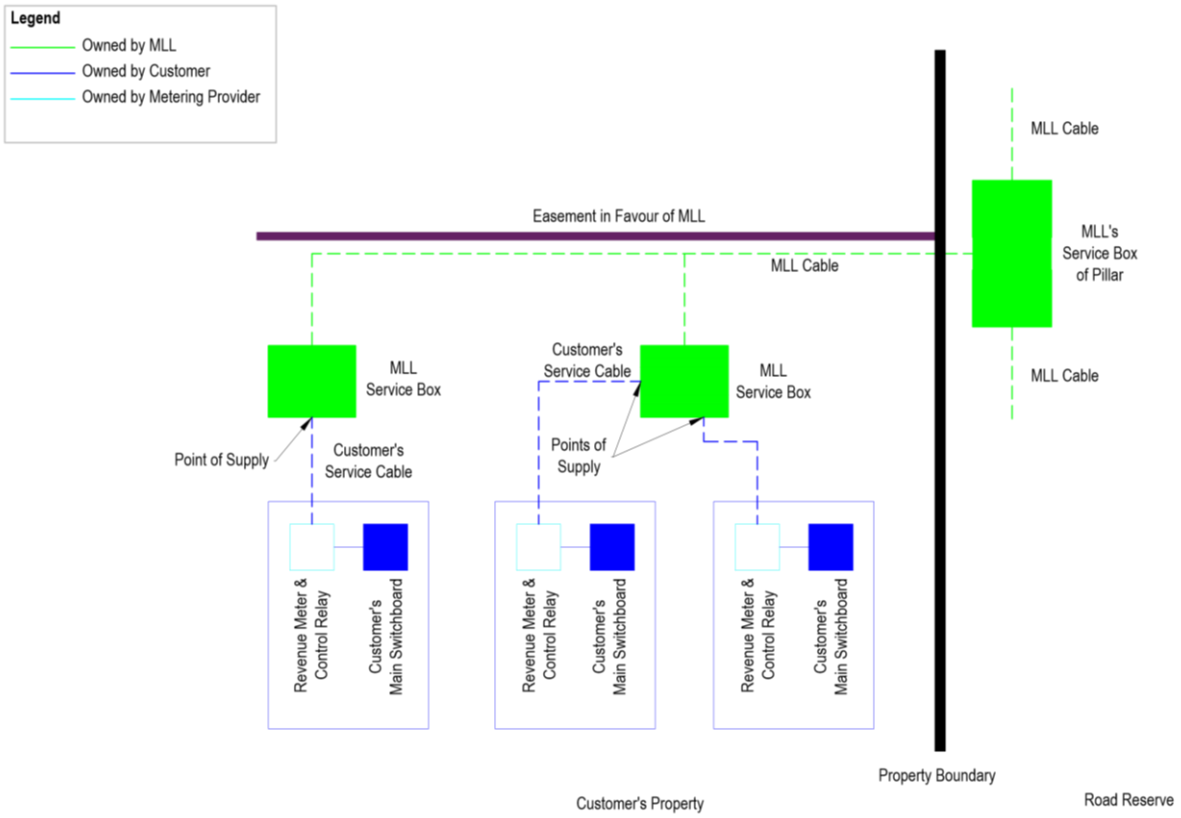
- Electrical Service Providers must understand the technical requirements in section 5 of these Standards and how this applies to the customer's installation.
- Poles may be required to be installed on the customer's property to meet the safe electrical clearance requirements of ECP 34.

- The Electrical Service Provider must calculate the volt drop from the customer's installation to MLL's lines to determine if a transformer (as shown in the diagram above) is required to be installed to meet the requirements of AS/NZS3000 section 3.6.
- Electrical Service Provider must ensure that overhead conductors and poles owned by the customer are designed in accordance with AS/NZS3000 section 3.12.
- Depending on the rated capacity of the transformer, access issues and proximity of neighbours, this may be able to be shared across neighbouring properties. MLL, however, must approve this.

10.4 Configuration D - Multi-dwelling connections

Option 1: MLL owns the LV cables inside the customer's property (for example on right of ways):

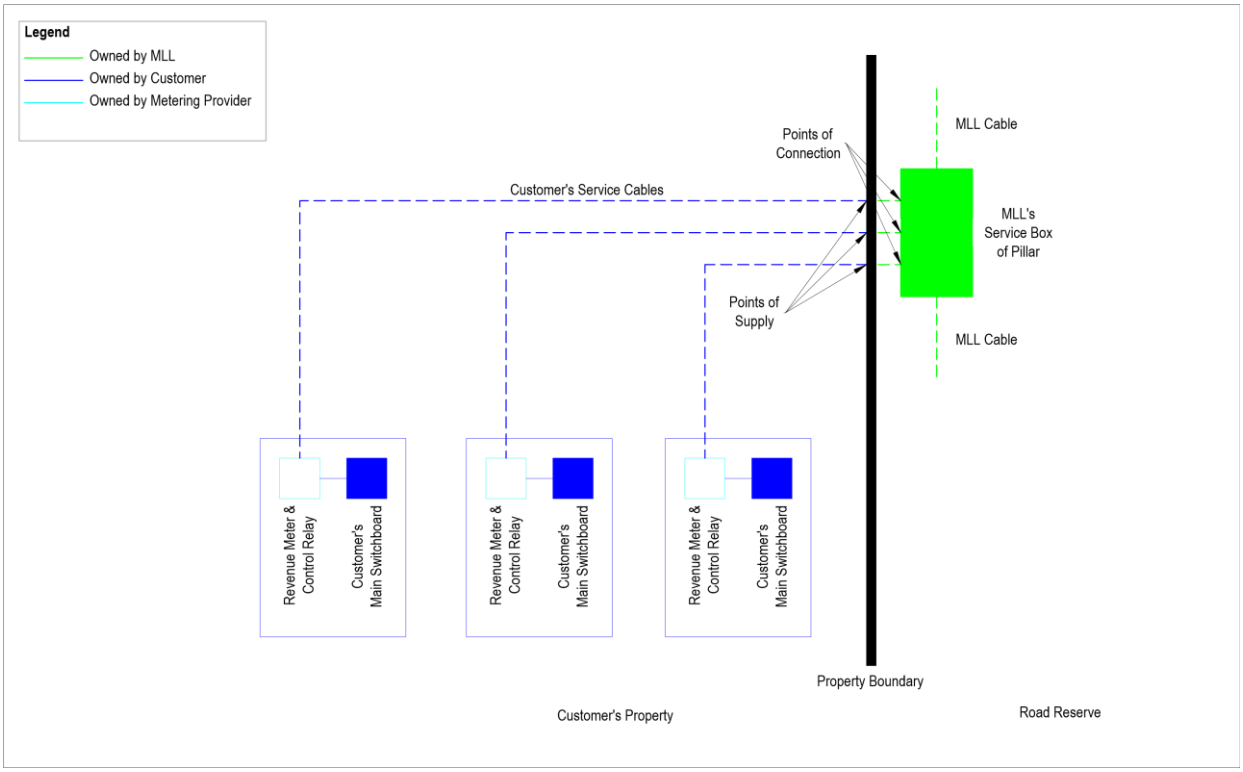
Figure 10-4 Multi-dwelling shared underground connection asset ownership



Note: MLL accepts reticulating inside right of ways provided that the customer agrees to grant an easement in favour of MLL to protect the equipment and allow MLL to operate and maintain the equipment. MLL will keep/maintain records of this equipment and the easement protecting it.

Option 2: The customers own the LV cables inside their property:

Figure 10-5 Multi-dwelling underground connection asset ownership

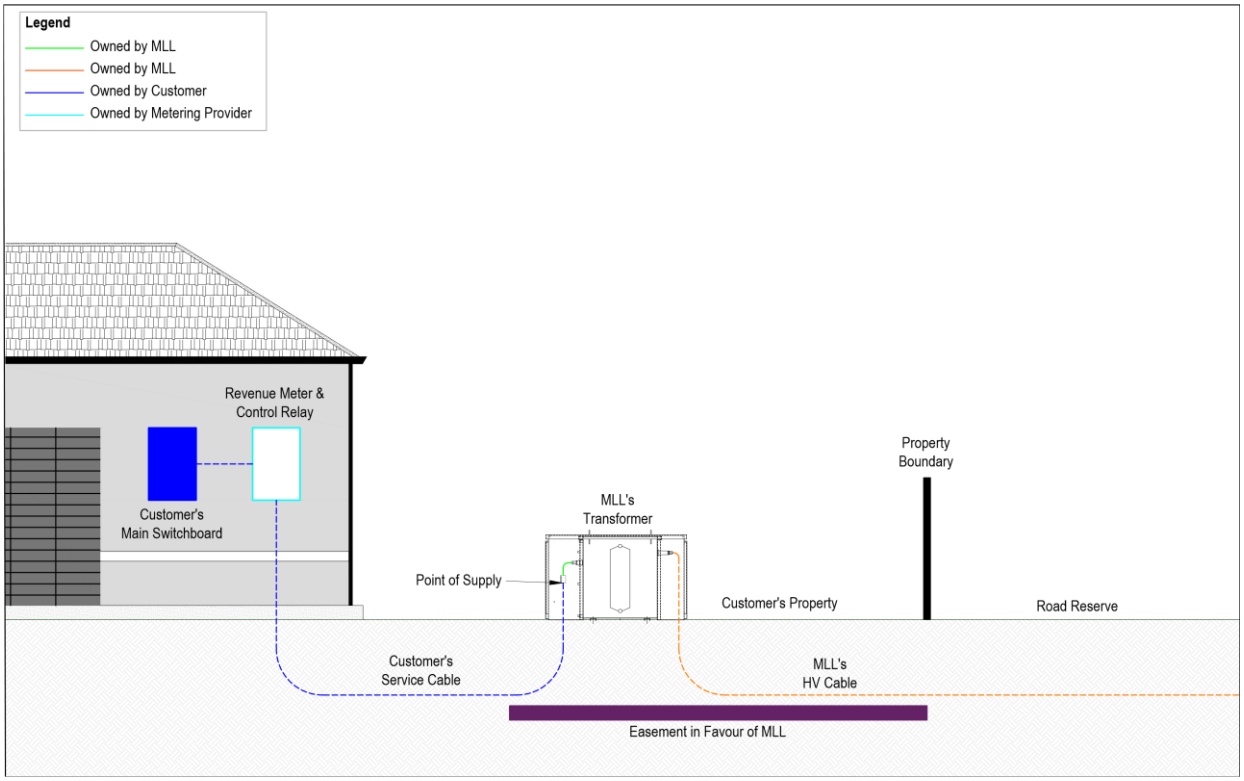


- The customer is responsible for the construction, maintenance and repair of their installation up to the Point of Supply (POS). Under Option 1, the Points of Supply for the three dwellings are at MLL's service boxes or pillars where the customers' service cables are connected. MLL will install the LV cables and service boxes or pillars within the easement area created in the customers' development and will require an easement to protect its cables and service boxes or pillars inside the customers' property.
- Under Option 2, the Points of Supply for the three houses are at MLL's service boxes and pillars at the property boundary. The customers will install their service cables from their houses to MLL's service box or pillar at the property boundary. No easement is needed.
- Customers must be familiar with their obligations as detailed in section 3 of these Standards.
- If the customer wishes to construct the cables and service boxes themselves and hand over ownership to MLL for ongoing maintenance and operation, they will need to design and construct the equipment to MLL's standards. MLL will not accept ownership without clear evidence that the equipment is installed to MLL's standards. Additionally, an easement in favour of MLL to allow operation and maintenance of the equipment is required prior to MLL accepting ownership.
- MLL is responsible for the ongoing repair and maintenance of equipment it owns. Customers are responsible for the ongoing repair and maintenance of equipment they own.
- The Electrical Service Provider must understand the technical requirements in section 5 of these Standards and how this applies to the customer's installation.
- Multi-dwellings with more than five ICPs must have a single point of isolation (e.g. a switch or a fuse) for all the customers.
- The customer must always provide unrestricted maintenance access to MLL's equipment as per the easement conditions.

10.5 Configuration E - Transformer connection (for connections over 100 A / 3 phase)

MLL installs its own substation inside the customer's property.

Figure 10-6 Typical HV underground connection asset ownership



- The customer is responsible for the construction, maintenance and repair of their installation up to the Point of Supply (POS).
- Customers must be familiar with their obligations as detailed in section 3 of these Standards.
- The customer will need to grant an easement in favour of MLL covering the area occupied by MLL's cables and substation.
- The customer must always provide unrestricted maintenance access to MLL's equipment as per the easement conditions. For connections made before 1 January 1993, MLL's access rights are covered by the Electricity Act section 23.
- As this configuration has complex customer responsibilities, the customer must discuss these with their Electrical Service Provider.
- The Electrical Service Provider must understand the technical requirements in section 5 of these Standards and how this applies to the customer's installation.
- Protection systems will be reviewed and agreed between MLL and the customer to ensure the settings are coordinated so that the customer's protection operates before MLL's network protection.
- The easement in this configuration is to allow MLL to access its equipment for maintenance or fault restoration.
- MLL will supply and design the transformer and substation in collaboration with the customer to ensure it meets their requirements.

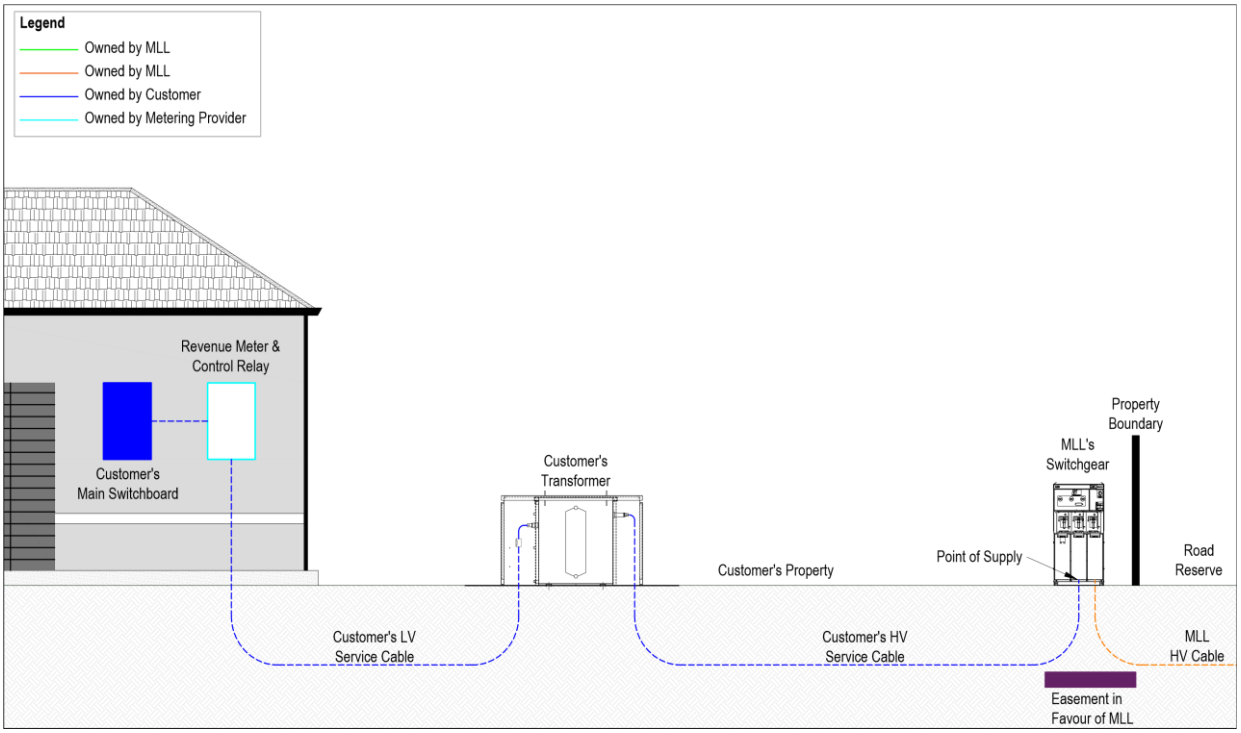
10.6 Configuration F - HV Customer connections

MLL provides an HV source of supply for customers to connect their transformers. The HV source is usually at an HV switch. If the HV switch is installed inside the customer's property, an easement in favour of MLL is required to allow operation and maintenance of the equipment.

The following diagram shows that the metering is on the LV side. In some cases, when the customer's demand is very large, or spread across multiple transformers, the Electricity Retailer or metering owner may require the metering to be carried out at HV. Any HV metering equipment will be arranged

between the customer and the Electricity Retailer. MLL does not allow HV metering equipment to be installed in its switchboards.

Figure 10-7 HV underground connection asset ownership



This installation configuration is usually only cost effective for installations 1MVA or over. In addition to this, the installation has many regulations for the customer to comply with to maintain and operate their HV equipment. It is highly recommended that the customer discusses these requirements with an HV Engineering Consultant to understand these requirements before committing to this type of connection.

In the above diagram, MLL's switchgear is installed inside the customer's premise. An easement in MLL's favour covering the switchgear and associated cables will be required. The alternative is for MLL to install its switchgear outside the customer's premises, if it is practical to do so. Typically, customers who opt for this design own more than one transformer on site. In this case, they may either request MLL to install multiple switch panels, or they will install their own switchgear for the connection of their transformers.

- The customer must implement routine safety checking systems as per the Electricity Safety Regulations section 40.
- The customer must develop maintenance and operational procedures for their HV equipment based on best practises and to meet New Zealand legislation.
- The customer must employ competent Electrical Service Providers to maintain their equipment as detailed in section 3.
- The customer is responsible for the maintenance of their installation up to the Point of Supply.
- Customers must be familiar with their obligations as detailed in section 3 of these Standards.
- The customer must always provide unrestricted maintenance access to MLL's equipment as per the easement conditions. For connections made before 1 January 1993, MLL's access rights are covered by the Electricity Act section 23.
- As this configuration has complex customer responsibilities, it is highly recommended that the customer discusses these with an HV Engineering Consultant.
- The Electrical Service Provider must understand the technical requirements in section 5 of these Standards and how this applies to the customer's installation.
- Protection systems shall be reviewed and agreed between MLL and the customer.

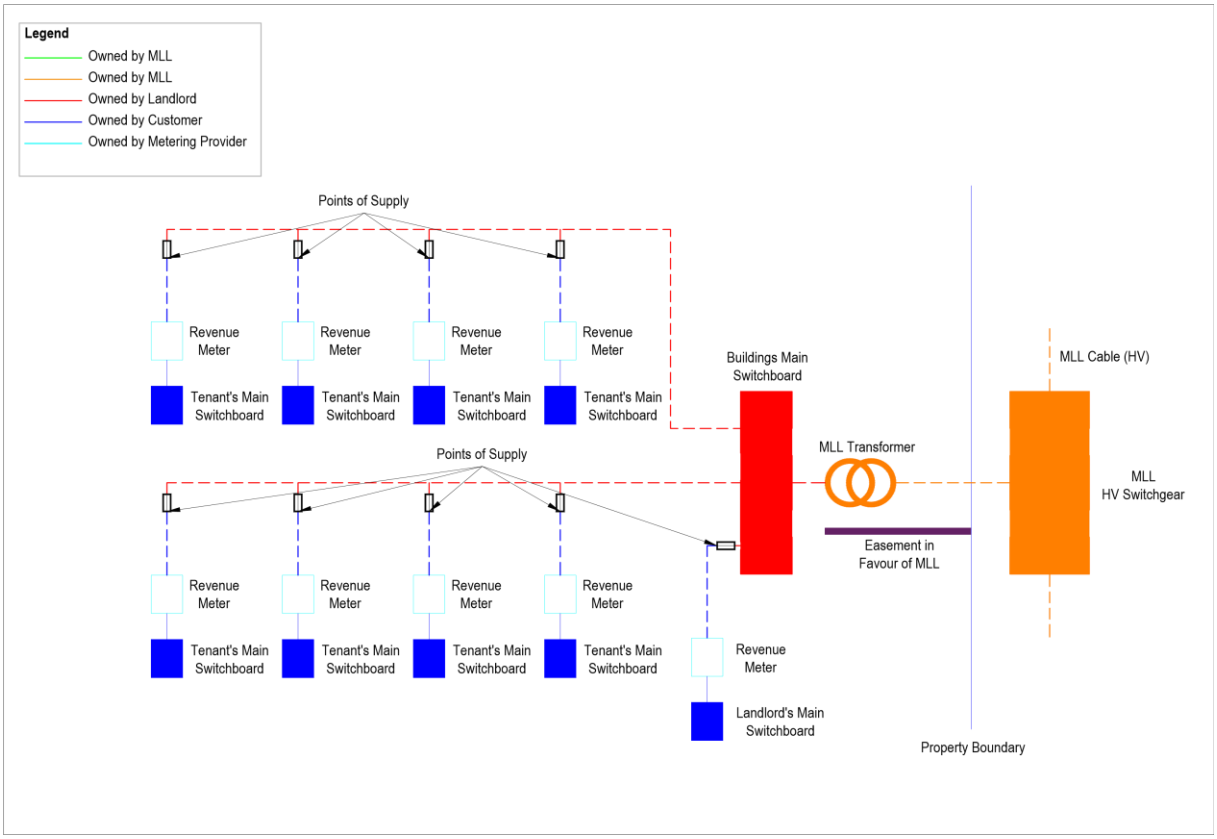
- MLL will design and install their switchgear in collaboration with the customer to ensure it meets all technical and health and safety requirements.
- The easement in this configuration is to allow MLL to access their equipment for maintenance or fault restoration. The design must adhere to all conditions of the easement.

10.7 Configuration G - Transformer connections to commercial/industrial developments with multiple tenants

The following diagram shows a typical supply to a commercial/industrial development with multiple tenants. The development may be a high-rise office building (vertical development) or industrial park (horizontal development). MLL's supply from the LV terminals of the transformer is connected to the building's main switchboard from which the landlord and tenants are connected.

It should be noted that the developer may choose to own their transformer and become an HV connection. In this case, the developer needs to refer to the requirements of section 10.6 of these Standards.

Figure 10-8 Shared building connection asset ownership



- In this configuration, the developer of the site may (or may not) continue to own the building. For the purpose of this section, the roles of the developer and the customer are separated. The developer is responsible for constructing the installation within the building. Once completed, the building will be handed over to the landlord who will become responsible for the ongoing maintenance and operation of the building/installation. MLL will not be involved in the ongoing maintenance and operation of the wiring installation inside the development.
- The landlord will apply to MLL for a supply connection and be assigned an ICP number, thus becoming a customer of MLL.
- The landlord may choose to rent the building space to tenants and request MLL to assign ICP numbers to these tenants who would become MLL customers.
- The customer (landlord) will need to grant an easement in favour of MLL covering the area occupied by MLL's cables and transformer.

- The customer (landlord) must always provide unrestricted maintenance access to MLL's equipment as per the easement conditions. For connections made before 1 January 1993, MLL's access rights are covered by the Electricity Act section 23.
- The Electrical Service Provider must understand the technical requirements in section 5 of these Standards and how this applies to the customer's installation.
- Protection systems shall be reviewed and agreed between MLL and the customer to ensure the gradings are coordinated.
- The easement in this configuration is to allow MLL to access its equipment for maintenance or fault restoration.
- MLL will supply and design the transformer and substation in collaboration with the customer to ensure it meets their requirements.

10.8 Customer sites supplied by multiple Points of Supply

Due to technical issues (such as load sharing between the different incoming circuits, increased prospective short circuit current, protection setting and back feeding from other Points of Supply) and potential safety hazards, customers are not allowed to interconnect the multiple Points of Supply supplying the site without prior written approval from MLL. In providing the approval, MLL will require site-specific information from the customer in order to make the assessment. MLL may impose conditions on any approval granted.

The following scenarios are possible configurations for parallel operation of different Points of Supply.

1. The site is supplied by more than one HV feeder, no parallel operation of the feeders is allowed.
2. The site has multiple transformers owned by MLL to supply the customer's LV main switchboard: Where MLL owns the transformers, it has an obligation to protect the equipment and operating personnel. Parallel operation of the transformers may result in certain faults (such as a fault at the HV tails connecting the transformer) not being detected. The only configuration for which parallel operation of transformers is allowed is for two transformers to form a group and for the group to be controlled by a single circuit breaker. Although this is allowed, it is not preferred.
3. The site has multiple transformers owned by the customer to supply the customer's LV main switchboard: The customer is responsible for the design and installation of the transformers, LV switchboard and protection schemes. MLL's responsibility is to ensure it provides the customer a means of protection and isolation. However, MLL does not recommend that the customer operate the transformers in parallel.

Appendix A - Fault Level

The following table shows the prospective short circuit currents at the LV terminals of the 11kV/LV distribution transformers supplied by MLL. These prospective short circuit currents are calculated using the following assumptions:

- Fault level at the 11kV terminals 13.1kA
- Transformer impedances based on supplier's data
- Earthing resistance (at substation and customer's premises) 1 ohm

A suitably sized HRC fuse may be used to limit the through fault energy experienced on downstream assets or customer installations.

These figures may be used by customers for reference.

Table 3 Maximum Fault Levels at TX terminals

Transformer capacity	Three Phase Prospective Short Circuit Currents at the LV terminals
100kVA	3.6kA
200kVA	6.3kA
300kVA	9.4kA
500kVA	14.6kA
750kVA	20.4kA
1000kVA	26.6kA