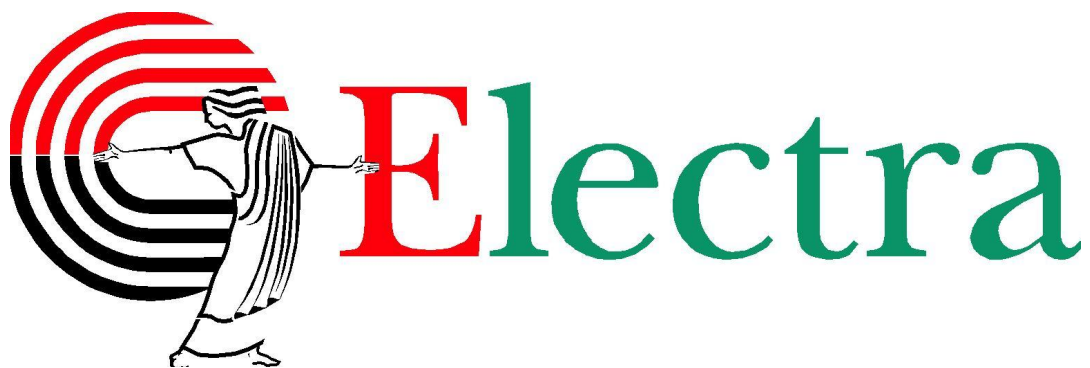


Connection and operation of generation rated at greater than 5MW capacity



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1. Introduction

1.1 Introduction

This document describes...

- What distributed generation is all about, and what safety, technical, operational, commercial and regulatory issues may be encountered.
- Our policy on connection and operation of distributed generation rated at greater than 5MW capacity.
- The processes that you must complete to connect distributed generation rated at greater than 5MW capacity to our network.
- The forms that you must complete as part of your initial and final applications to connect distributed generation rated at greater than 5MW capacity. It is preferable that you discuss your intended generation with us by phone or in person as soon as possible so that issues can be resolved before you submit an initial application.

The connection of distributed generation is regulated by the Electricity Governance (Connection Of Distributed Generation) Regulations 2007. These regulations specify a number of matters such as the time period within which we must process your application, the maximum fees that we can charge for processing your application and inspecting your generation, and a series of default terms & conditions. This document is based on the Regulations, and where this document is inconsistent or unclear, the Regulations shall prevail.

1.2 Definitions

Connection assets means assets such as (but not limited to) lines, poles, transformers, cables, fuses, reclosers or circuit breakers necessary to connect generation to our network.

Regulations means the Electricity Governance (Connection Of Distributed Generation) Regulations 2007 or any regulation passed in substitution thereof.

Requirements means the requirements referred to in Sections 2.2

to 2.6 of this document.

We, us, our, ours and similar words means Electra Ltd.

You, your, yours and similar words means the party wishing to connect distributed generation to Electra's network.

2. What is distributed generation

2.1 Distributed generation

Although a precise definition of distributed generation is difficult to formulate it is usually recognised as generation that is embedded within a distribution network. In the context of distributed generation rated at greater than 5MW capacity, this would most typically take the form of hydro or wind turbines that would probably need to be connected at either sub-transmission (33kV or 66kV) or transmission (110kV) level.

2.2 Safety requirements

Your generation must comply with the following safety requirements...

- The specific requirements contained in the [Electricity Regulations 1997](#).
- The general requirements contained in the Health & Safety in Employment Act 1992.

2.3 Technical requirements

Your generation must comply with the following technical requirements...

- [AS 4777.1 2002](#)
- [AS 4777.3 2002](#)
- [AS/NZS 3000](#)

If your generator will be connected through an inverter you will also need to comply with the following additional requirements...

- [AS 4777.2 2002](#)
- Use an inverter [approved](#) for our network

2.4 Operational requirements

Your generation must comply with the following operational requirements...

- Your generation must include a switch or circuit breaker that disconnects and locks out if mains voltage is lost on our network or if the mains frequency dips below 49.5Hz for more than 2 seconds. This is to ensure that our network is not back-livened from your generation which would create a safety hazard for our faults staff.
- Clear and durable notices must be prominently posted near the point of connection to our network, and at your switchboard and meter box stating that there is connected generation. This is to warn people of the possibility that your installation could still be live even if the mains have been disconnected.

2.5 Commercial requirements

Your generation must comply with the following commercial requirements...

- Because we are a lines business and not an energy business (as defined in the Electricity Industry Reform Act 1998) we cannot purchase the energy from your generation. You must have a contract in place with a retailer for the purchase of the energy you generate, or provide evidence that you will be consuming all this energy yourself. You may not simply "lose" the energy in our network.
- You must have a meter in place capable of recording all energy flowing from our network into your generator. If you wish to share in any network or transmission benefits arising from your generator you will need to install a time-of-use meter capable of recording the energy flowing from your generator into our network.
- The energy retailer that you contract with for purchase of exported energy, metering services and data management may charge you for doing so. Ensure that you request a copy of their tariffs.

2.6 Regulatory requirements

Your generation may require one or more of the following classes of consents...

- Resource consent issued by the Regional Council.
- Resource consent issued by the District Council.
- Building consent issued by the District Council.

You may also need to liaise with other agencies such as (but not limited to) Land Transport, the Civil Aviation Authority or the Department of Conservation if your generation extends into areas like road reserve, flight paths or ecologically sensitive areas. We do not provide advice on these matters nor do we issue such consents.

3. Our policy

3.1 Open access network

Our policy for network access is that anyone who meets the applicable safety, technical, operational and commercial requirements and who agrees to pay the applicable charges can connect to our network.

The details of our distributed generation policy are set out in Section 4.6 of our Asset Management Plan.

3.2 Funding & ownership of connection assets

Connection of your generation to our network may require construction of specific assets, such as a few spans of line, a length of cable or a disconnecter. These assets are referred to as connection assets and can be funded and owned in the following ways...

- You can install and own these assets at your expense subject to them meeting our usual technical requirements for connection to our Network. This option will require you to take all usual ownership responsibilities and obligations such as planning and building consents, safety, maintenance, fault restoration, land issues and tree trimming.
- You can make a capital contribution (possibly up to 100%) and we will install and own the assets. In this case we will assume all usual ownership responsibilities and obligations.

3.3 Funding technical modifications

You may also need to pay for any technical modifications such as re-calibration of protection or control equipment.

3.4 Limiting the density of generation

Our network was originally designed to distribute electricity in one direction from large grid substations. Moreover the light rural nature of much of our network means it would be difficult if not impossible to connect a single generation installation greater than 5MW in most locations. We therefore reserve the right to decline an application to

connect any generation to our network if we believe that installing generation in that area could interfere with the operation of our network (including overloading it) or with our customers' quality of supply. In the event that we receive more than one application to connect generation to part of our network the Regulations allow us to treat those applications as competing bids for limited capacity as long as we consider the overall purpose of the Regulations.

3.5 Change of occupancy or ownership

It is important that any new owner or occupant of a premise involving distributed generation is aware of the safety, technical, operational and commercial aspects. Accordingly you must advise us of any new occupant or owner so we can discuss their obligations with them.

3.6 Confidentiality of your application

The Regulations allow us to divulge the broad details (but not necessarily the ownership details) of generation applications to other applicants whose generation might be affected by your generation.

4. Connection process

4.1 Step #1 (your initial application)

To begin the connection process you must provide us with the following information in writing although we would prefer you phoned us to discuss your intentions first. Please use Form 1 at the back of this document and include additional pages as required.

- What type of generation you intend to connect (hydro, wind etc).
- The manufacturers' rating of your generator, or if this is not possible, a certification that its maximum rating is greater than 5MW.
- The configuration of your proposed generation, in particular whether your generator is a new generator or an addition to an existing generator. If your proposed generator is an addition, the rating of your entire installation at a single point of connection to our network must be greater than 5MW.
- The technical specifications of your generator and associated equipment including maximum real power, reactive power requirements, resistance and reactance, fault level contribution, means of voltage and frequency control, synchronisation and expected operating modes.
- The technical specifications of the equipment that will disconnect your generation from our network if mains voltage is lost.
- Exactly where you expect to install your generation.
- The exact point at which you propose to connect to our network.
- Evidence that your generation will meet the requirements set out in Sections 2.3 to 2.5 of this document.

Your completed Form 1 will need to be accompanied by a payment of \$5,000.00 plus GST payable to Electra Ltd. If your completed Form 1 does not provide sufficient information for us to determine if your proposed generator meets the standards set out in Sections 2.2 to 2.5 of this document, we may ask you for further information.

4.2 Step #2 (our response to your initial application)

Upon receiving your initial application, we are required to advise you within 5 working days whether your initial application is complete. If your initial application is incomplete we will advise you of the information you will need to include when you reapply.

Within 30 days of receiving a correctly completed initial application the Regulations require us to provide you with the following information...

- (a) Information about the capacity of the distribution network, including both the design capacity (including fault levels) and actual operating levels.
- (b) Information about the extent to which connection and operation of the distributed generation may result in a breach of the relevant standards for safety, voltage, power quality, and reliability of supply to our connected customers and other generators.
- (c) Information about any measures or conditions (including modifications to the design and operation of the distribution network or to the operation of the distributed generation) that may be necessary to address the matters referred to in points (a) and (b) above.
- (d) The approximate costs of any network-related measures or conditions identified under point (c) above and an estimate of time constraints or restrictions that may delay the connecting of the distributed generation.
- (e) Information about any further detailed investigative studies that we reasonably consider are necessary to identify any potential adverse effects on our network resulting from the proposed connection, together with an indication of...
 - Whether we agree to the generator, or a suitably qualified agent of the generator, undertaking those studies; or
 - If not, whether we could undertake those studies and, if so, the reasonable estimated cost of the studies that the generator would be charged.

- (f) Information about any obligations to other parties that may be imposed on us and that could affect the distributed generation (for example, obligations to Transpower, in respect of other networks, or under the rules).
- (g) Any additional information or documents that we consider would assist the generator's application.
- (h) Information about the extent to which planned and unplanned outages may adversely affect the operation of the distributed generation.

You may also make written requests for information such as single line diagrams, equipment ratings, normal switch configurations (including fault levels), and protection system details relevant to the proposed point of connection. We are required by the Regulations to provide such information within 10 days of receiving your written request.

If either you or we become aware of new information that is relevant to your application, that party must make reasonable endeavors to pass that information to the other party.

4.3 Step #3 (your final application)

You can make a final application to connect your generation at any time within 12 months of receiving the information set out in section 4.2 above. Your application must include the correctly completed Form 2 (at the back of this document) and copies of any technical studies that we have asked you to undertake.

When we receive your correctly completed final application we are required by the Regulations to make reasonable endeavors to notify in writing...

- Everyone who has made an initial application to connect generation to a part of our network that we believe could be affected by your application.
- All generators connected to that part of our network on the regulated terms and conditions that could be affected by your generation.

If we receive a final application from another generator within 10 days of receiving your final application, we may consider the two final

applications as competing bids for limited connection capacity as long as we keep the overriding principles of the Regulations in mind otherwise we must treat final applications on a “first come, first served” basis.

Upon receiving a correctly completed final application from you that includes evidence that your generation will meet all safety requirements, all statutory requirements and our technical and operating requirements, we must do one of the following three things within 80 working days...

- Provide written notification that your final application has been approved with no additional conditions.
- Provide written notification that your final application has been approved but with additional conditions. In such a case we must set out the conditions in detail, state why those conditions are necessary, specify any charges payable by you, and advise you of how you can challenge our decision under the dispute resolution process set out in Schedule 3 to the Regulations.
- Provide written notification that your final application has been declined. In such a case we must advise you why your final application has been declined, how you can re-apply, and how you can challenge our decision under the dispute resolution process set out in Schedule 3 to the Regulations.

We may also ask you for an extension of up to 40 working days to process your final application which you cannot reasonably refuse.

4.4 Step #4 (you give notice to proceed)

If we approve your application to connect generation, you must advise us in writing within 30 working days whether you intend to connect your generation, although we can extend this period at our discretion. This written notice of intention to proceed must include the details of your generation and confirm your acceptance of any conditions that we may have imposed on your connection. If you do not accept any conditions we may have imposed, but wish to proceed with connecting you must notify us of this dispute within the 30 day period.

If you do not provide such written notice, our obligations under the Regulations cease. You can however make a new application.

4.5 Step #5 (negotiate connection contract)

Once you have notified us in writing of your intention to connect your generation, we have 30 working days (starting from the date at which we receive your written notice of intention to connect) to mutually negotiate a connection contract. This period can be extended by mutual agreement.

If we cannot agree on with you on mutually acceptable connection terms and conditions, the regulated terms and conditions set out in Schedule 2 of the Regulations will apply.

4.6 Step #6 (we connect your generation)

Before you connect your generation to our network, you must test your generation. You must also give us sufficient notice of these tests so that we can witness the tests for which we will charge you \$1,200.00 + GST.

You must also provide us with a comprehensive test and inspection report that includes confirmation that any metering will fulfill its intended purposes.

Form 1 – Initial application

Initial application for connection of distributed generation rated at greater than 5MW (12 pages including this page).

- Your contact details

Full name _____

Postal address _____

Street address _____

Daytime phone _____

Mobile phone _____

Fax _____

Email _____

- At what location do you wish to connect your generation (please specify map reference if possible).

- Do you wish to connect your generation to

[] An existing Electra asset.

[] At a location that will require new connection assets.

- How many phases is your generation

[] 1-phase [] 3-phase

- What sort of entity wishes to connect the generation

- Single individual Limited company Incorporated society
 Trust Other (please specify below)
-

- What type of generation do you intend to connect to our network.

- Hydro Wind Thermal
 Other (please describe below)
-

- What is the manufacturers' rating of your generator (must be greater than 5MW).
-

- Will your generation be

- An entirely new installation.
 An addition to an existing generator. If it is an addition to an existing generator, the entire installation must be rated at greater than 5MW.

- Please attach the following technical information. Where possible please use sketches, photo's and photocopies of brochures etc.

- The configuration of your proposed generation.
 The technical specifications of your generator and associated equipment.
 The technical specifications of the equipment that will disconnect your generation from our network if mains voltage is lost.

- Declaration

In submitting this inquiry I certify that all of the above information and any attached information is true and correct. I also certify that the

generation we intend to connect to Electra's network is rated at greater than 5MW and acknowledge Electra's full and unlimited right to disconnect our generation should it not be capable of generating at a rate greater than 5MW or if any part of this inquiry proves false or fraudulent.

Signature of applicant _____

Post your completed initial application form and payment for \$5,000.00 plus GST (payable to Electra Ltd) to PO Box 244, Levin or deliver to the Corner of Bristol & Exeter Sts, Levin.

For office use only

Date received _____

Date response required by _____

Initial application processed by _____

Initial application number _____

Initial application handed to _____

Confirm payment attached _____

Date payment banked _____

Confirm form correctly completed _____

- Appendix 1 to Form 1 – Required generator information

In order to meet Transpower's Asset Capability Information requirements you may need to provide the following information as part of your initial application.

General generator details

- Generating plant name. _____
- Primary energy source. _____
- Prime mover description. _____
- Nominal connection voltage. _____
- Total installed capacity at point of generation. _____
- Total maximum continuous rating (MCR). _____
- Maximum plant continuous output if different from station continuous output. _____
- Reason for difference if MCR is not equal to plant continuous output. _____
- Attach single line diagram. []

Reactive power and voltage control at your site

- Reactive power range. _____
- Attach detailed description. []

General generator characteristics

- Synchronous / asynchronous _____
- Unit designation eg. G1 _____
- Nominal kVA rating _____

- MCR if different from nominal rating. _____
- Reason if different. _____
- Rated terminal voltage. _____
- Terminal voltage range. _____
- Turbine / generator inertia constant. _____
- Active aux load at rated power. _____
- Reactive aux load at rated power. _____
- Short circuit ratio (synchronous). _____
- Synchronous rotor type (salient pole or round). _____
- Asynchronous rotor type (wound or cage). _____
- Does aux load trip with unit ?? _____

Synchronous machine characteristic curves

- Attach generator capability curves. []
- Attach open circuit characteristics. []
- Attach short circuit characteristics. []
- Attach generator v-curve. []
- Attach zero power factor curve. []
- Attach unbalanced load time curve []

Synchronous machine unsaturated impedance (in per unit on generator MVA base)

- Armature or stator resistance (R_a). _____

- Direct axis synchronous reactance (X_d). _____
- Quadrature axis synchronous reactance (X_q). _____
- Direct axis transient reactance (X'_d). _____
- Quadrature axis transient reactance for round rotor machines (X'_q). _____
- Direct axis sub-transient reactance (X''_d). _____
- Quadrature axis transient reactance for round rotor machines (X''_q). _____
- Leakage reactance (X_l). _____
- Negative sequence reactance (X_2). _____
- Zero sequence reactance (X_0). _____
- Earthing resistance (R_e). _____
- Earthing reactance (X_e). _____
- Earthing transformer ratio. _____

Synchronous machine time constants (open circuit)

- Direct axis transient open circuit time constant ($T_{d0'}$). _____
- Quadrature axis transient time constant for round rotor machines ($T_{q0'}$). _____
- Direct axis sub-transient open circuit time constant ($T_{d0''}$). _____
- Quadrature axis sub-transient open circuit time constant ($T_{q0''}$). _____

Synchronous machine saturation data

- Saturation factor (1.0). _____
- Attach detailed functional description. []
- Attach excitation system diagram. []
- Settings and parameters. _____
- Generator field time-current characteristics. _____

Synchronous machine governor or frequency control system

- Attach detailed functional description []
- Settings and parameters. _____

Asynchronous machines

- Attach detailed functional description []
- Reactive power range. _____
- Attach voltage control block diagram. []
- Settings and parameters. _____
- Power factor correction capacitors (total kVA_r). _____
- Power factor correction capacitors (step sizes) _____

Asynchronous machine governor or frequency control system

- Attach detailed functional description []
- Attach control system block diagram. []
- Settings and parameters. _____

Network connection circuit breakers

- Equipment label eg. CB1 _____
- Rated voltage. _____
- Attach design single line diagram. []
- Point of connection. _____
- Nominal current rating. _____
- Short circuit rating (3 second). _____

Network connection disconnectors

- Equipment label eg. SW1 _____
- Rated voltage. _____
- Attach design single line diagram. []
- Nominal current rating. _____
- Short circuit rating (3 second). _____

Protection settings

- Have protection systems been coordinated on both sides of network connection ?? _____
- Has agreement been reached with System Operator on proposed network connection ?? _____
- Have sufficient circuit breakers been provided ?? _____
- Do the protection systems disconnect faulted assets within the minimum time _____

??

- Are the protection systems selective when operating ?? _____
- Do the protection systems support system stability ?? _____
- Have 400 volt protection systems been duplicated and CB Fail alarms been provided ?? _____
- Are protection systems similar to existing design for adjacent assets (for lower voltage) so as to ensure coordination of protection schemes ?? _____
- Is there a means of checking synchronism ?? _____

Indications and measurement

- Is a "Station Net MW export" indicator provided ?? _____
- Is a "station Net MW import" indicator provided ?? _____
- Is a "Station Net MVar export" indicator provided ?? _____
- Is a "Station Net MVar import" indicator provided ?? _____
- Attach estimated generation / demand [] profile in enough detail for us to identify all generation scenarios.

Restrictions

- Attach details of any special islanding, [] protection or synchronising requirements.

Operational data

- Attach details of any low load restrictions. []
- Attach your 24 hour contact details []
- Cold start time to achieve minimum load (all plant types). _____
- Warm start time to achieve minimum load (thermal plant only). _____
- Hot start time to achieve minimum load (thermal plant only). _____
- Typical time from cold start to maximum load (all plant types). _____
- Typical power ramping rate from minimum load to maximum load. _____

Asynchronous machine impedances (in per unit on generator MVA base)

- Stator resistance (R_1). _____
- Stator leakage reactance (X_1). _____
- Magnetising reactance (X_m). _____
- Rotor resistance (R_2). _____
- Rotor leakage reactance (X_2). _____

Frequency performance data

- Lowest frequency at which machine can run continuously. _____
- Low frequency trip setting Trip 1. _____

- Time delay on low frequency trip setting Trip 1. _____
- Low frequency trip setting Trip 2. _____
- Over frequency trip setting Trip 1. _____
- Time delay on over frequency trip setting Trip 1. _____
- Over frequency trip setting Trip 2. _____
- Time delay on over frequency trip setting Trip 2. _____
- Attach frequency performance curve or tabulation of frequency, power and time. []

Generator transformer general details

- Nominal voltage ratio including any tertiary windings. _____
- Number of windings per phase. _____
- Rating of HV winding. _____
- Rating of LV winding. _____
- Rating of any tertiary windings. _____
- Vector group. _____
- Iron losses. _____
- Attach B-H curve. []
- Attach details of construction type.

Generator transformer resistance and reactance

- Positive sequence resistance (HV to LV). _____

- Positive sequence reactance (HV to LV). _____
- Zero sequence resistance (HV to LV).
- Zero sequence reactance (HV to LV). _____

Generator transformer tap changer

- Attach description of tap changer. []
- Which winding is tapped (HV or LV). _____
- Step size (%).
- Number of taps. _____
- High to low voltage range (Hi% to Lo%).
- Number and voltage of nominal tap position.

Form 2 – Final application

Final application for connection of distributed generation rated at greater than 5MW (3 pages including this page).

- Unique identification number assigned to your initial application

Unique identifier _____

- Your contact details

Full name _____

Postal address _____

Street address _____

Daytime phone _____

Mobile phone _____

Fax _____

Email _____

- Confirmation that our requirements will be met (attach supporting documentation as necessary).

Safety requirements

Technical requirements

Operational requirements

Commercial requirements

- Confirmation that external regulatory requirements such as resource, planning or building consents will be met (attach supporting documentation as necessary).

External regulatory requirements.

- A certificate of compliance certifying that your generation is electrically safe. This certificate must be signed off by both the electrical worker who installed your generation and a person who is a registered electrical inspector under Part 9 of the Electricity Act 1992 and who is competent with distributed generation.

[] Attached completed certificate.

- Details of energy retailer who will buy your energy

Company _____

[] Attached copy of energy purchase agreement.

- Details of electrical worker who will connect your generation

Person _____

Registration _____

- Declaration

In submitting this final application I certify that all of the above information and any attached information is true and correct. I also certify that the generation we intend to connect to Electra's network is rated at greater than 5MW and acknowledge Electra's full and unlimited right to disconnect our generation should it be unable to generate at a rate greater than 5MW or if any part of this application proves false or fraudulent.

Signature of applicant _____

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For office use only

Date received _____

Date response required by _____

Final application receipted by _____

Final application handed to _____

Confirm form correctly completed _____