Tasmanian Networks Pty Ltd
ABN 24 167 357 299

Guideline for the Connection of Embedded Generators to the TasNetworks Distribution Network

(For AS4777 compliant Micro Generating Units - refer to the Guideline for the Connection of Micro Embedded Generators to the TasNetworks Distribution Network (AS4777 Compliant))

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1. INTRODUCTION

Tasmanian Networks Pty Ltd ABN 24 167 357 299 (TasNetworks) is a state government owned network service provider providing transmission and distribution services. Reference to TasNetworks, us, we or our in this guideline is a reference to TasNetworks in its capacity as the owner and operator of the regulated distribution network in Tasmania, unless an alternative meaning is explicitly given in the text.

Please note when you are considering connecting an embedded generator that you contact us regarding the physical connection of the generator and your Retailer to discuss billing and tariff arrangements.

These guidelines have been developed to provide information to embedded generator proponents who are intending to connect generating units to the TasNetworks distribution network. This document covers generating units up to 10 MW.

If you are connecting a micro generating unit with connection via an AS4777 approved electronic inverter please refer to the Guideline for the Connection of Micro Embedded Generators to the TasNetworks Distribution Network (AS4777 Compliant).

Generators that are registered participants will have their applications assessed in accordance with chapter 5 of the NER.

Whilst this guideline refers to maximum generation up to 10 MW in capacity; for generation above 10 MW a similar process applies but NER clause 5.3.5(e) requires that transmission are consulted regarding your connection.

The capacity of the distribution network to receive electricity produced by large embedded generating units depends on the location and the local characteristics of the distribution network. Electricity production can be limited to significantly less than 10 MW. Under these circumstances we will aim to meet your requirements; however, it may be appropriate to seek a transmission connection.

This guideline aims to provide assistance to identify the responsibilities of all parties involved with respect to connection requirements for embedded generating units and assist applicants applying for a connection to our distribution network. This includes an outline of TasNetworks technical requirements for connection and safe operation of embedded generating units connected to TasNetworks distribution network including:

- safety of TasNetworks employees and customers, embedded generator personnel and the public;
- protection of distribution system assets and the embedded generating system against any abnormal operation;

- power quality requirements and voltage control;
- response to power system disturbances;
- anti-islanding systems;
- remote control requirements; and
- operational procedure requirements.

2. DEFINITIONS

There are a number of terms that are used within this guideline that require a definition and they are outlined below.

AEMC means the Australian Energy Market Commission.

AEMO means the Australian Energy Market Operator.

Business day means a day that is not Saturday or a Sunday and is not observed in Tasmania as a public holiday pursuant to the Statutory Holidays Act 2000 (Tas).

Connection agreement/contract means the contract between you (the embedded generator) and us (TasNetworks) that needs to be entered into in accordance with either chapter 5 or chapter 5A of the NER.

Connection applicant has the same meaning as given in the NER.

Connection point is the agreed point of supply between TasNetworks distribution network and the embedded generator's private electrical installation.

Distribution network means the electricity network owned and operated by Aurora.

Embedded generating unit means a generating unit connected within a distribution network and not having direct access to the transmission network

Embedded generator, you or your means a person that owns, controls or operates an embedded generating unit (you). It also includes customers with their own generation.

ESI Act means the Electricity Supply Industry Act 1995 (Tas).

ESI Regulations means the Electricity Supply Industry Regulations 2008 (Tas).

Generating unit means the actual generator of electricity and all the related equipment essential to its functioning as a single entity.

Intending participant has the same meaning as given in the NER.

Islanding (island) means any situation where the part of the distribution network containing your connection point becomes separated from the power system and your embedded generating unit(s) maintain any form of electrical supply, be it stable or not, to any section of the separated distribution network.

Joint operating procedures means the operating procedures necessary to ensure that all disconnection, reconnection, fault, emergency or other planned maintenance carried out which affects your connection point are coordinated with us to not threaten power system security and are implemented in accordance with clause 5.9.2 of the NER.

Large generating unit means a generating unit having a capability greater than a Micro generating but typically less than 10 MW.

For generation above 10 MW, NER clause 5.3.5(e) requires that transmission are consulted regarding the connection.

Metrology procedure means the NEM Metrology Procedure published by AEMO in accordance with clause 7.14(b) of the NER.

Micro embedded generator means a retail customer who operates, or proposes to operate, an embedded generating unit for which a micro EG connection is appropriate.

Micro EG connection means a connection between an embedded generating unit and a distribution network of the kind contemplated by Australian Standard AS4777 (Grid connection of energy systems via inverters).

Micro generating unit means a generating unit having a capability of less than 10 kVA for a single phase connection or 30 kVA for a three phase connection, or as contemplated by AS4777.

Model standing offer means a document approved by the AER as a model standing offer for TasNetworks to provide basic connection services (see NER clause 5A.B.3) or as a model standing offer to provide standard connection services (see NER clause 5A.B.5).

NER means the National Electricity Rules that are published by the AEMC.

Network service provider has the same meaning as given in the NER.

Non-registered embedded generator means an embedded generator that is neither a micro embedded generator nor a registered participant.

Point of common coupling (PCC) means the point where a local electric power system is connected to the distribution network.

Power system means the electricity power system of Tasmania including associated generation and transmission and distribution networks for the supply of electricity, operated as an integrated arrangement.

Registered participant has the same meaning as given in the NER.

TasNetworks, us, we or our means Tasmanian Networks Pty Ltd, ABN 24 167 357 299, in its capacity as a distribution network service provider licensed in accordance with the provisions of the ESI Act unless an alternative meaning is explicitly given in the text.

TEC has the same meaning as "Code" in the ESI Act, or as amended or succeeded from time to time, and is issued by the Tasmanian Economic Regulator.

Tee-up means an appointment requested by your installer or your electrical contractor with us for the purpose of connecting your generating unit(s).

Transmission network has the same meaning as given in the NER.

3. BACKGROUND

The basic principles relating to connection to the Tasmanian network are specified in the ESI Act, the TEC and the NER.

All embedded generators have the opportunity to form a connection to a network and have access to the network services provided by TasNetworks Tasmanian distribution system.

The terms and conditions on which connection to a network and provision of network service is to be granted are to be set out in a commercial connection agreement/contract on reasonable terms entered between TasNetworks, as a network service provider, and the embedded generator. A particular requirement under clause 8.7.1 of the TEC is that the connection agreement/contract must require the parties to abide by and comply with the TEC. In addition to TEC and NER compliance obligations there are a number of standards and guides that might be used in assessment of the embedded generator application for connection (refer to section 8.8of this guideline).

In accordance with provisions of the ESI Act, a licence may be required to generate electricity. The ESI Regulations detail the circumstances in which a license is not required; being:

(a) the electricity is generated by a generator with a capacity of 5 MW or less; or

(b) the electricity is:

  (i) generated by a generator that is not normally connected to a power system or has a primary function other than the generation of electricity for sale; and

  (ii) not sold.

Generally registration under chapter 2 of the NER with AEMO is not required for embedded generators. However the generator should assure themselves of the NER requirements and AEMO exemptions granted under clause 2.2.1(c) of the NER.

4. RESPONSIBILITIES

We are responsible for the safe and effective operation of the distribution network in compliance with the TEC.

As a licensed entity under the *Electricity Supply Industry Act 1995* we are responsible for ensuring that generators connected to our distribution network meet the requirements placed upon the generators in the TEC and the NER.

We have established procedures in place to process requests for generating unit connections to our distribution network. We may disconnect your generating unit if it is causing 'nuisance' to other customers connected to our distribution network.

As the owner and operator of a generating unit, you are responsible for the safe and correct installation, operation and maintenance of your generating unit in accordance with appropriate legislation, standards and any agreed joint operating procedures. In particular, your generating unit(s) must comply with generator performance standards as agreed under the connection contract.

For further guidance please contact your electrical consultant or Worksafe Tasmania. You can visit their website at worksafe.tas.gov.au.

You should contact us regarding the development of any joint operating procedures.

You may be required to contribute towards the costs associated with your generating unit's connection to our distribution network and the installation and operation of your unit(s) while maintaining the connection.

Please note that, where the proposed connection of your embedded generating unit(s) must comply with chapter 5 of the NER Australian Energy Market Operator (AEMO) may undertake their own review of the engineering studies. AEMO will charge for any of this work they deem is required. You will be responsible for the payment of these costs if they are required.

5. PLANNING AND SELECTION

We are not able to offer you assistance in the planning and selection of your generating unit. It is advisable to engage the services of an experienced consultant in this field to assist you in the planning and selection of your generating unit. To avoid unnecessary expenditure once you have narrowed down your preferred generating unit, it is suggested you contact us to discuss your chosen designs and equipment to confirm compatibility with our distribution network; and your retailer regarding tariffs before entering into purchase contracts.

The Clean Energy Council of Australia (CECA) has details of accredited installers, suppliers and consultants. You can visit their website at www.cleanenergycouncil.org.au.

6. MAJOR TYPES OF GENERATING UNITS

Generating units may be of a number of types and exhibit a variety of electrical characteristics. In broad terms generating units can be categorised as follows:

- synchronous generating unit,
- asynchronous generating unit, and
- inverter based energy systems.

6.1. SYNCHRONOUS GENERATORS

A synchronous generating unit is a rotating electrical machine that has an internally derived voltage source that aligns with (is in synchronism with) the network voltage when connected to our distribution network. Synchronous generating units connect directly to the network and rotate at constant speed, the synchronous speed, as determined by the power system. Synchronous generating units are essential to maintain power system performance within acceptable limits both under normal conditions and following disturbances.

Synchronous generating units must be fitted with automatic synchronisation facilities that ensure generated voltages are in synchronism with those of our distribution network before connection is made between the generating unit and the distribution network.

The terminal voltage of synchronous generating units can be normally controlled to meet voltage control and reactive power requirements.

Synchronous generating units could continue to operate in an islanded mode and normally require control schemes to prevent this mode of operation. If disconnected from the network a synchronous generating unit can maintain supply to the local facility.

6.2. ASYNCHRONOUS GENERATORS

An asynchronous generating unit is a rotating electrical machine that has an externally derived internal voltage through its network connection. Although asynchronous generating units electrically connect directly to our distribution network they do not operate in synchronism with the network voltage and rotate at variable speeds.

Synchronising equipment is not required and it is possible to electrically connect an asynchronous generating unit directly to our distribution network even when it is stationary subject to the network being able to maintain suitable voltage levels and the generating unit being able to withstand the associated starting currents.

The terminal voltage of asynchronous generating units cannot be normally controlled to meet voltage control and reactive power requirements. To meet these requirements it is common to supplement the connection with reactive support capacitors. Alternatively, double fed induction generators that have power electronic interfaces between the rotor and the electrical connection to the stator are able to control both speed and reactive power flows.

Self-excited asynchronous generating units are a derivative of asynchronous generating units where the machine voltage is supplied by the connection of additional reactive support capacitance. This type of machine can operate in an islanded mode similarly to a synchronous generating unit and normally require control schemes to prevent this mode of operation.

6.3. INVERTER BASED ENERGY SYSTEMS

Inverter based energy systems are generating units that use semiconductor power electronic devices to convert either direct current or alternating current electrical energy sources into electricity sources that have voltages that align with (are in synchronism with) the network voltage. That is the electrical energy source is not directly connected to the network but requires an interposing power electronic inverter. As such synchronising equipment is also not required as the electronics form that function.

A wide range of inverter based technologies is available. Energy sources supplying inverter based generating units include, direct current generation such as battery and solar photo-voltaics and synchronous generating units with a different frequency to that of the power system such as permanent magnet generating units associated with wind turbines.

Connection of inverter based systems up to 10 kVA single phase and 30 kVA three phase is provided for in an Australian Standard that covers the “Grid connection of energy systems via inverters.”[1] If the inverter based system is compliant with AS4777 then it can connect to the network subject to any specific conditions associated with the particular connection.

Please refer to the ‘Guideline for the Connection of Micro Embedded Generators to the TasNetworks Distribution Network (AS4777 Compliant).’

The Clean Energy Council of Australia has information on the models of inverters that comply with AS4777.

TasNetworks may approve connection of generating units less than 10 kVA single phase or 30 kVA three phase that do not have certification of compliance with the AS4777 series, provided that the technical and safety requirements and principles as articulated in AS4777.3 (in particular sections 2, 3, 4, 5 and Appendices A and B) can be satisfactorily demonstrated.

7. MODES OF OPERATION

There are basically three modes of operation for embedded generation:

- isolated;
- connection without power export; and
- connection with power export

7.1. ISOLATED

In an isolated mode of operation an electrical connection cannot occur between your generating unit and our distribution network, except to the extent of any common earth and or neutral connections.

Your generating unit(s) are essentially a back-up supply to that from our distribution network and can maintain supply in the event of loss of supply from our distribution network. Normal supply is delivered from our distribution network.

For this type of installation, suitable switchgear is required that can be electrically, mechanically or key interlocked to prevent connection to our distribution network via either your facility or directly to the connection point. For low voltage installations particular precautions need to be taken to ensure the integrity of the neutral. In this regard, reference should be made to the TasNetworks Service and Installation Rules.

[1] Installation Requirements AS4777.1:2005, Inverter requirements AS4777.2:2005, Grid protection requirements AS4777.3:2005

Note that for these units a connection agreement/contract is not required as isolated generators are not physically connected to our distribution network.

7.2. CONNECTION WITHOUT POWER EXPORT

Your generating unit(s) can be electrically connected to our distribution network via either your facility or directly to the connection point. However; at all times your load demand will exceed the generating unit(s) output. That is, your site always imports power from our distribution network.

Your generating unit(s) can be continuously connected to our distribution network provided appropriate protection and control systems are provided to disconnect your facilities from the distribution network to prevent islanded operation.

If the connection of your generating unit(s) is intended to be only of a temporary nature (less than 15 seconds duration) then appropriate control schemes and operational procedures must be in place to prevent prolonged operation with your generating unit(s) connected to our distribution network. An example of temporary connection is for the purposes of testing seamless transfer of supply from our distribution network to your generating unit(s) or from your generating unit(s) to our distribution network.

Note that as these units are physically connected to our distribution network, a connection agreement/contract is required.

7.3. CONNECTION WITH POWER EXPORT

Your generating unit(s) can be electrically connected to our distribution network via either your facility or directly to the connection point.

If your load demand is less than your generating unit(s) output, you can export power to our distribution network. Appropriate protection and control systems are required to disconnect your facilities from our distribution network to prevent islanded operation.

Should you have no load demand, ie you are a “pure” embedded generator, you will export all your power to our distribution network. Appropriate protection and control systems are required to disconnect your facilities from our distribution network to prevent islanded operation.

Note that as these units are physically connected to TasNetworks distribution network, a connection agreement/contract is required.

8. TECHNICAL REQUIREMENTS

The technical requirements to be met by you are provided for in TEC clause 8.7 and more generally NER Schedule 5.2 provides for conditions for connection of generators.

In addition, TEC clause 8.6 and NER Schedule S5.1 detail network performance requirements to be provided or co-ordinated by us.

The following sections aim to provide a uniform standard for connection of embedded generating units and provide relevant performance, operation, testing, safety considerations and maintenance of the connection.

8.1. DISTRIBUTION NETWORK CONSTRAINTS AND ISSUES

The connection of a generating unit(s) to a distribution network may have impacts upon that network. As a result, before approval is given by us, we may need to undertake specific studies to ascertain these effects, and to implement mitigation where necessary. Mitigation measures may include the installation of protection systems and network augmentation.

Please note that connection of your embedded generating unit(s) will not be permitted until any mitigation action has been completed.

8.2. CO-ORDINATION AND COMPLIANCE OF EMBEDDED GENERATING UNITS

The technical matters that require co-ordination when establishing a connection include:

- design at the connection point;
- physical layout adjacent to the connection point;
- primary protection and backup protection;
- control characteristics;
- communications facilities;
- insulation co-ordination and lightning protection;
- fault levels and fault clearance;
- switching and isolation facilities;
- interlocking and synchronising arrangements; and
- metering installation.

As part of the connection enquiry and connection application processes you are required to provide all relevant information and data necessary to evaluate the connection and its impacts on the operation and performance of our distribution network. This information is detailed in NER schedules S5.4 and S5.5.

To assist with the provision of requisite data AEMO publishes Generating System Model Guidelines, a Generating System Design Data Sheet and a Generating System Setting Data Sheet[2] [3].

Under NER schedule S5.5.6 a connection with less than 30 MW to a distribution network will usually be required to submit less registered system planning data and less registered data than is indicated in the Generating System Model Guidelines, Generating System Design Data Sheet and Generating System Setting Data Sheet.

8.3. GENERATING UNIT PERFORMANCE

8.3.1. Reactive power capability

In accordance with NER schedule S5.2.5.1, the automatic access standard is a power factor of 0.93 lagging and leading. Lesser reactive capability can be negotiated where it can be demonstrated that operational and safety requirements will not be compromised.

For inverter based systems covered by AS4777 the power factor range is 0.8 leading to 0.95 lagging. Lagging power factor refers to the situation where the inverter acts as an inductive load from the perspective of the network.

8.3.2. Quality of electricity generated

NER schedule S5.2.5.2 details the quality of electricity generated requirements regarding voltage fluctuations, harmonics, and phase voltage unbalance.

The TEC, at clauses 8.7.4, 8.7.6 and 8.7.10, places obligations on us to meet quality of supply standards and electromagnetic interference. Table 2 in TEC chapter 8 details permissible variations around standard nominal voltages. Also Australian Standard AS 61000.3.100-2011 provides limits to steady state voltage limits in public electricity systems. Your generating unit(s) must not impact adversely on our ability to meet these requirements and mitigation actions would be included as part of the connection charges.

[2] http://www.aemo.com.au/en/About-AEMO/Energy-Market-Registration/Registering-in-Energy-Markets/Generating-System-Data-and-Model-Guidelines
[3] http://www.aemo.com.au/en/About-AEMO/Energy-Market-Registration/Registering-in-Energy-Markets

8.3.3. Response to disturbances & Partial load rejection

Your generating unit(s) is required to remain in service for:

- variations in system frequency and voltage as permitted under the NER; and
- for power system faults provided that the event is not one that would disconnect the generating unit from the power system by removing network elements from service.

For variations in system frequency limits to variation of your generating unit's active power transfer to the power system must be determined in accordance with NER schedule S5.2.5.11.

Your generating unit(s) must be capable of operating safely and be self-protecting when connected to our distribution network feeders that have automatic re-closers installed.

You must provide us with such information relating to the performance of your equipment during and after particular power system incidents or operating condition deviations as we reasonably require for the purpose of analysing or reporting on those power system incidents or operating condition deviations.

8.3.4. Operation within System Standards

Your generating unit(s) is required to be capable of remaining in service whenever the voltage at the connection point complies with the system quality of supply standards in NER schedules S5.1a.5, S5.1a.6 and S5.1a.7.

8.4. PROTECTION SYSTEM

Your generating unit(s) must be fitted with necessary protection relays, as agreed with us, in order to coordinate its ability to isolate itself from our distribution network in the event of generating unit unstable or distribution network abnormal operation or a fault on either our distribution network or your electricity infrastructure.

It is important that your generating unit's protection system and our protection system are coordinated to provide correct fault clearance and to minimise impacts on equipment.

Your generating unit(s) must have anti-islanding protection schemes that typically comprise rate of change of frequency (ROCOF), voltage vector shift, directional (export) power or directional over current or any other approved method that can detect a balanced load condition in an islanded state.

8.5. CONTROL SYSTEM

Your generating unit(s) must have automatic and/or manual control systems that are appropriate to the generating unit's capability and technology to regulate its generated voltage, active power and reactive power.

You must obtain our prior approval of the structure and parameter settings of the voltage, active power and reactive power control systems. You must not change, correct or adjust the structure or the parameter settings of these control systems without our prior approval.

You must have generating unit switching and operating procedures that are approved by us.

Automatic synchronising equipment is preferred to effect connection to our distribution network. Technical characteristics of chosen equipment should be sent to us for approval.

8.6. COMMUNICATIONS AND REMOTE MONITORING & CONTROL

We may require you to install remote monitoring and control equipment with secure electricity supply and provide appropriate telecommunications to transmit to our Distribution Control Centre in real time the quantities that we reasonably requires to discharge our distribution network service provider functions in accordance with good electricity industry practice.

A secure operational voice communication system may be required between our Distribution Control Centre and you. If required, you must provide out Distribution Control Centre the name and contact information for the person responsible for the operation of your generating unit(s).

8.7. FAULT LEVEL CONTROL

The connection of your generating unit(s) must not increase the fault level beyond the maximum design capability of either the transmission system or our distribution network or associated switching devices.

Your generating unit(s) contributions to connection point fault level values and facility switchgear details must be provided to us with the application for connection. Your switching devices and infrastructure must be designed to withstand the total fault current from our distribution network plus the your generating unit(s).

System fault levels (including maximum design capability) are available from us on request.

8.8. TECHNICAL STANDARDS AND GUIDELINES

The following are applicable to the connection of your embedded generating unit(s).

- Tasmanian Electricity Code
- National Electricity Rules
- TasNetworks Service and Installation Rules
- Energy Networks Association (Australia) Customer Guide to Electricity Supply November 2008
- Energy Supply Association of Australia Customer Guide to Electricity Supply March 2002

Relevant technical standards and guidelines are shown in the following table.

Australian Standards	Standard Title
AS 4777:2005	Grid Connection of Energy Systems via Inverters, Parts1, 2, 3
AS/NZS 3000	Electrical Installations (Wiring Rules), 3010 – Electrical Installations – Generating Sets, 3017 – Testing Guidelines
AN/NZS 61000	Electromagnetic Compatibility
AS 1359	General Requirements for Rotating Electrical Machines
AS 2006	Diesel Generators/internal combustion engines
AS 2184	Low voltage switchgear and control gear
AS 2373	Electric Cables
AS 2374	Power Transformers
AS 2915	Solar Photovoltaic Modules – Performance Requirements
AS 3010	Electrical Installations
AS 4509	Stand-alone power systems, Parts 1,2,3
AS/NZS 3008	Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV
AS/NZS 5033	Installation of photovoltaic (PV) arrays
AS 60038	Standard Voltages
AS 1931	High Voltage Test Techniques

AS 2344	Limits of electromagnetic interference from overhead a.c. powerlines and high voltage equipment installations in the frequency range 0.15 to 1000 MHz

9. CONNECTION FEES AND CHARGES

Fees and charges applicable to the installation of your generating unit(s) may include:

Application to connect fee:

We may request an application fee from you to investigate:

- connection arrangements at your site - preliminary connection design and estimates (which includes as applicable the connection line, substation, provision of any engineering reports, protection, and communications);
- studies of our network to determine if any network construction is required which may include an any impacts on our transmission network;
- liaising with AEMO to ensure there are no power system impacts; and
- preparation of our offer to connect and connection contract.

Customer contribution

This is a 'once off' cost to cover all reasonable costs incurred by us in undertaking the scope of works as identified within the negotiated offer to connect your generating unit to the distribution network and includes:

- the provision, installation and commissioning of your generating units dedicated connection assets such as transformers and any extension assets; and
- any network augmentation or extension required to facilitate your generating unit's connection such as reinforcement of the existing network, including any protection.

This charge will be calculated in accordance with our customer capital contributions policy. Our customer capital contributions policy is available on our website.

Avoided TUoS

You may be eligible for payments for avoided Transmission Use of System usage charges (avoided TUoS). Clause 5.5(h) of the NER requires us to pass through to you any avoided charges for the locational component of prescribed transmission use of system services charges arising from your connection. Avoided TUoS is calculated and passed through retrospectively based on actual historic performance of your generation and the application of the published transmission cost allocation methodology and pricing methodology as approved by the Australian Energy Regulator.

TasNetworks does not guarantee that the connection of your generating unit(s) will necessitate the payment of avoided TUoS. Avoided TUoS payments will be confirmed, or otherwise, as part of the negotiations surrounding your connection.

Connection service and management fee (where applicable)

This is an annual fee to cover all reasonable costs incurred by us in undertaking the following:

- routine maintenance and repairs of your connection assets including substation equipment specifically installed for your access to the distribution network (i.e. circuit breaker/recloser, protection equipment including inter-trip/radio communications equipment/telemetry interface relays/ SCADA RTU interface);
- maintenance planning / coordination with you;
- compliance monitoring of any interface protection in accordance with applicable regulations; and
- connection contract management including periodic review of the contract to cover changes in industry practice in compliance with the NER and the TEC.

Metering provider fee (where applicable)

The type of metering and associated requirements depends on the annual amount of electrical energy throughput as detailed in NER schedule 7.2.

You may have to arrange for your own metering requirements. We can make an offer on suitable terms and conditions to provide the entire metering service.

For tariff customers, TasNetworks is responsible for providing, maintaining and reading the metering.

Customers with annual energy consumption less than 150 MWh, who accept a model standing offer, are deemed to be tariff customers for the purposes of metering requirements. Under these circumstances we are responsible for:

- the provision, installation and maintenance of metering installations; and

- the validation, substitution and estimation of metering data for type 5 to 7 metering installations in accordance with the metrology procedure.

Tariff assignment will vary according to the load requirements of the customer. A Generator might be a demand customer and on a demand tariff for load purposes but meters will only record exported energy as kWh.

Please note that an embedded generator may elect to feed their panels into multiple tariffs for example T31, T41. This is only possible where a system has two inverters and effectively operates as two systems. If the set up requires additional metering, additional metering charges may be applicable. Alternatively a single element meter could be employed to offset TOU tariff charges. For further information on acceptable installation arrangements and tariffs please refer to the TasNetworks Service and Installation Rules, which is currently under review.

10. NETWORK CONNECTION PROCEDURES (NER)

Chapters 5 and 5A provide for the process of connection enquiry, connection application, offer to connect, negotiation, acceptance and dispute resolution associated with the establishment of connection agreements.

Chapter 5 of the NER establishes the process to be followed by a Registered Participant or a person intending to become a Registered Participant for establishing or modifying a connection to our network or for altering generating plant connected to our network. However; any person who is not a Registered Participant may agree with us to follow the chapter 5 connection process. As part of a connection agreement any person who is not a Registered Participant may also agree with us to comply with chapter 5 technical requirements.

On the other hand, chapter 5A applies to, or in relation to, a connection applicant that is not a Registered Participant.

TEC clause 8.7.1 provides that:

(b) We must not connect an Embedded Generator to our distribution system unless a legally binding and enforceable connection agreement is in place which requires the parties to abide and comply with the TEC.

(c) The connection agreement must contain the specific conditions that have been agreed to for connection and access to our distribution network, including but not limited to:

(1) details of the connection point including the distribution network coupling points where appropriate;

(2) metering arrangements and adjustments for losses where the point of metering is significantly different to the connection point;

(3) authorised demand which may be taken or supplied at the connection point (under specified conditions);

(4) connection service charges;

(5) payment conditions;

(6) duration and termination of conditions of the connection agreement;

(7) terms, conditions and constraints that have been agreed to for connection to the network to protect our legitimate interest including rights to disconnect you for breach of commercial undertakings;

(8) details of any agreed standards of reliability of distribution service at the connection points or within the network;

(9) testing intervals for protection systems associated with the connection point;

(10) agreed protocols for maintenance co-ordination; and

(11) procedures for resolving disputes.

The negotiated connection process is used by us to manage the connection of large generating units and micro generating units where the Basic Connection Service and Offer are not applicable. The process is based on chapters 5 and 5A of the NER.

Specific information detailing the connection process is provided at Attachment 1.

The connection of your generating system to our distribution network may necessitate us to undertake specific studies to determine potential impacts arising from your connection and subsequent operations. These impacts - in particular safety, technical, operational and performance impacts - must be understood and mitigation activities implemented prior to connection. Any adverse impacts on the power system, and existing connections, may prevent the connection proceeding until a satisfactory solution has been implemented.

The control and recording of micro and large-embedded generating units connected to the power system is imperative in managing the safety, quality and reliability of supply.

You must undertake your own studies and provide all necessary information to support us undertaking the necessary investigations with respect to the connection of your generating unit(s) to our distribution network.

You will be required to indemnify us against all legal claims, suits and actions resulting from the use of our distribution network in a manner that could jeopardise the safety and efficiency of our distribution network.

11. NOTICE OF ALTERATION TO DESIGN

You must not significantly alter the design of the embedded generation installation without our prior written consent. If at any time you wish to propose an increase in the agreed export capacity of your embedded generation installation, you must request the increase in writing to us.

Upon receipt of a written request, we will advise you if it is necessary for us to undertake new network analysis and produce an engineering report (at your cost) in order to ascertain any operational constraints of your embedded generation installation with the proposed changes to the installation.

12. DISCLAIMER

While we make every effort to ensure that this information and material is current and accurate, the information and material is provided to you on the understanding that:

- We make no warranty, guarantee or promise, express or implied, in relation to the content or accuracy of this information and material.
- You will seek verification and/or professional advice from an independent source before relying on or acting upon any of this information and material.
- We are not liable or responsible in any way for the results of any actions taken on the basis of this information and material.

To the fullest extent permitted by law, we expressly exclude any and all liability whatsoever and responsibility to any person arising in connection with their use or reliance of the information and material in whole or in part.

Please note that approval from us to connect a generating unit to the distribution network is only an acknowledgement that the embedded generating unit is suitable to be connected to the distribution network at the location requested at the time of your application. Our approval does not in any way indicate, guarantee, or approve you are or will be eligible to receive payments, credits or other forms of entitlements from any government or retailer sponsored energy feed-in rebate schemes. Your eligibility should be determined with the relevant agencies responsible for the payment or provision of such entitlements at your earliest convenience.

13. REVISIONS

We may amend and expand this guideline from time to time where it may be necessary to meet requirements of the applicable regulations and to suit the needs of the distribution network.

14. Attachment 1 - Connection Application Process – Negotiated Connection Service

1 INTRODUCTION

This document outlines the application process to be followed when an embedded generator requests a Negotiated Connection Service to connect a generating unit in accordance with chapter 5A of the NER. Generators who are registered participants or intending registered participants will be assessed in accordance with chapter 5 of the NER.

This document is applicable for connecting generating units up to 10 MW, whose connection is not a Basic Connection Service and covered by model standing terms and conditions.

However, if you are proposing to connect an AS4777 compliant micro generating unit (examples include wind, solar, mini hydro) please refer to the Guideline for the Connection of Micro Embedded Generators to the TasNetworks Distribution Network (AS4777 Compliant).

Whilst this guideline refers to maximum generation up to 10 MW in capacity; for generation above 10 MW a similar process applies but NER clause 5.3.5(e) requires that transmission are consulted regarding your connection. A generating unit above 10 MW may need to apply for a connection to the transmission network.

This process commences at the point you enquire about arranging a distribution connection, through to the final “switch-on” of your generating unit.

A flow chart at the end of the document provides a high level overview of the following process.

Important: Please note this process does not deal with any approach you should make to your retailer regarding their tariffs or payments that your retailer may make for any electricity utilised within the distribution network.

2 PROCESS

2.1 YOU WISH TO INSTALL A GENERATING UNIT

The **first step** if you are interested in connecting an embedded generating unit to our distribution network is to either contact us (telephone, letter, e-mail, or visit www.tasnetworks.com.au) and/or contact an equipment supplier, consultant or a Clean Energy Council of Australia accredited installer who deal with embedded generating units.

Where we have been contacted by you, we will write to you sending a copy of the connection application form. You may also refer to our website where this information can be located.

Our letter will advise you that further information can be provided on request or alternatively can be found on our website listed under “Embedded Generation”.

Where you have specific enquiries that raise issues regarding your connection, we will respond within **5 business days** noting any issues to be resolved or negotiated.

If you have initially contacted an equipment supplier, consultant or accredited installer, they may deal with your initial enquiry and completion of the connection application form [see step 2.2].

In the majority of cases your installer will manage and submit the relevant paperwork on your behalf.

2.2 COMPLETED CONNECTION APPLICATION FORM

You or your installer returns the completed and signed connection application form as early as possible to avoid any delays in your connection.

You may return the connection application form through your installer or electrical contractor, provided the contractor is authorised to complete the application on your behalf.

The application to connect must include the technical details of your proposed generating unit(s), the generating unit(s) export capacity, and the proposed connection point. Typical information requirements include:

- the location (site address) of the proposed installation of your generating unit(s);
- the capacity and operating voltage of your proposed generating unit(s);
- technical details of your generating unit(s)
- proposed connection arrangement diagram(s);
- proposed protection scheme; and
- a brief summary of the operational philosophy of your proposed embedded generating unit(s) (e.g. stand-by, co-generation, demand management, testing, etc).

Please provide all required details on the application form in order to avoid any delays.

2.3 CHECK APPLICATION DETAILS AND PRELIMINARY RESPONSE

We will check the details that you have provided in your connection application form.

We will then prepare a preliminary response and send to you or your installer.

We may include in the response as applicable:

- advice on the feasibility of your proposal and requested location;
- further information that we consider is required or outstanding issues that must be addressed to determine the actual requirements of your proposed connection;
- clarification around the access standards, which will include quality of supply, voltage and power factor operating parameters, protection and any fault current limiting measures that may be required;
- if known, outline solutions to any issues identified or flag problems still needing resolution;
- detail the preliminary programme showing proposed milestones and timing;
- advise you that further information can be provided on request or alternatively can be found on our website.
- whether a network study and applicable application fee is required;
- advise on any site inspection fees;
- the amount of any other fees payable on confirmation of the application to connect to cover:
    - other costs anticipated to be incurred by our transmission network, AEMO and other entities who may participate in the assessment of your application to connect;
- whether an extension to the distribution network is required and any applicable application fee;
- the identity of any works that are contestable; and
- other parties we consider:
    - must be involved in planning to make your connection and must be paid for their services; or
    - will be required to enter into any agreement with you;
- for each technical requirement relevant to your proposed installation, provide or clarify for the generating unit(s) details of:
    - the automatic access standards;
    - the minimum access standards;
    - the applicable generator standards; and

- whether AEMO must be involved in negotiation of that technical requirement; and

- any other outstanding information which you must prepare to enable us to further process your application to connect including:

  - details of your connection requirements and specifications of the installation to be connected;

  - details of your reasonable expectations of the levels and standards of service of power transfer capability that the distribution network should provide;

  - a list of technical data to be included to suit the size and complexity of your proposed installation to be connected; and

  - commercial information to be provided by you to allow us to assess your ability to satisfy any prudential requirements.

You should provide the requested information and updated connection application form along with any required application fee as early as possible.

Where your application has specific circumstances that raise issues regarding your connection, we will respond within **10 business days** noting any issues to be resolved or negotiated.

Please note that any application fee must be paid by you before we will undertake any assessment and make you an offer to connect.

We will then review the information and undertake the study in consultation with you, and we will also prepare a negotiated connection offer.

2.4 ASSESSMENT AND OFFER

Once all the required information has been received by us, we have **65 business days** to make you an offer to connect.

Prior to connection of your generating unit(s) to the distribution network, we must carry out an appropriate detailed analysis study of the network. This is to verify that the proposed installation of your embedded generating unit will not cause any adverse effects on our distribution network.

Any issues arising such as augmentation or performance are investigated collaboratively across TasNetworks teams and via discussions with you or your installer as required.

We will confirm that your connection application includes approved certification that your generating unit complies with our requirements for connection to our distribution network.

We may determine that further testing and inspection of your generating unit(s) must be carried out for the purposes of confirming that the generating unit(s) meets our technical requirements. Provided the details in your connection application form are correct and adequate certification has been provided (as determined by us) that guarantees the safety of your generating unit(s) connecting to our distribution network and meets our technical requirements; we can make you an offer to connect.

Using the above information we will prepare a negotiated offer to connect including any schedules. This approved offer will be finalised and sent to you for signature. The schedules may include necessary terms and conditions covering; easements, indemnity and constructing the connection including the applicable connection charge. In addition we may also need to develop joint operational procedures in addition to the development of protection systems with you. Finalised and agreed joint operational procedures are a condition precedent of any finalisation of your connection.

We will negotiate any terms with you in accordance with our negotiating framework.

If you accept our offer, you should return the signed acceptance to us, along with applicable connection charge, within **20 business days**.

If you decline our offer and cancel your proposal to connect or do not respond within 20 business days, the connection application process is closed. We will send you a letter confirming the process has ceased.

2.5 CONNECTION CONTRACT

Your connection application together with your connection offer, the schedules and any joint operational procedures will form the connection contract between you and us upon your acceptance.

2.6 INSTALLER INSTALLS GENERATING UNIT AND SENDS EWR TO TASNETWORKS

Your installer may then install your generating unit.

Your installer is required to send an Electrical Works Request (EWR) to us via your retailer to allow us to fit an import/ export meter and to undertake any necessary works to alter or augment the distribution network. This must occur prior to the installer switching your generating unit on.

2.7 ACCEPTANCE RECEIVED

We will match your received connection offer acceptance against the installer's received EWR.

If alterations have been made to the technical specification of your generating unit(s) then a new technical assessment and connection offer will have to be prepared and re-sent by us for your signature [return to step 2.5].

If we receive an EWR but have not received a connection application form or connection offer acceptance from you, we will investigate who the applicant is and ask that you, or your installer submit a connection application form and/ or signed acceptance letter. [return to step 2.2 regarding the submission of a connection application form or step 2.5 regarding an outstanding connection contract and acceptance].

2.8 NETWORK CONSTRUCTION AND METER REPLACEMENT

Provided we have matched your received acceptance against a received EWR, we will progress the arrangements to have an import/export meter fitted and to undertake any necessary works to alter or extend the distribution network.

Any necessary works to alter or extend the distribution network will be undertaken within an agreed time as per the connection contract.

Once all construction is complete please allow roughly **10 business days** to have a meter fitted unless a tee-up is requested by your installer.

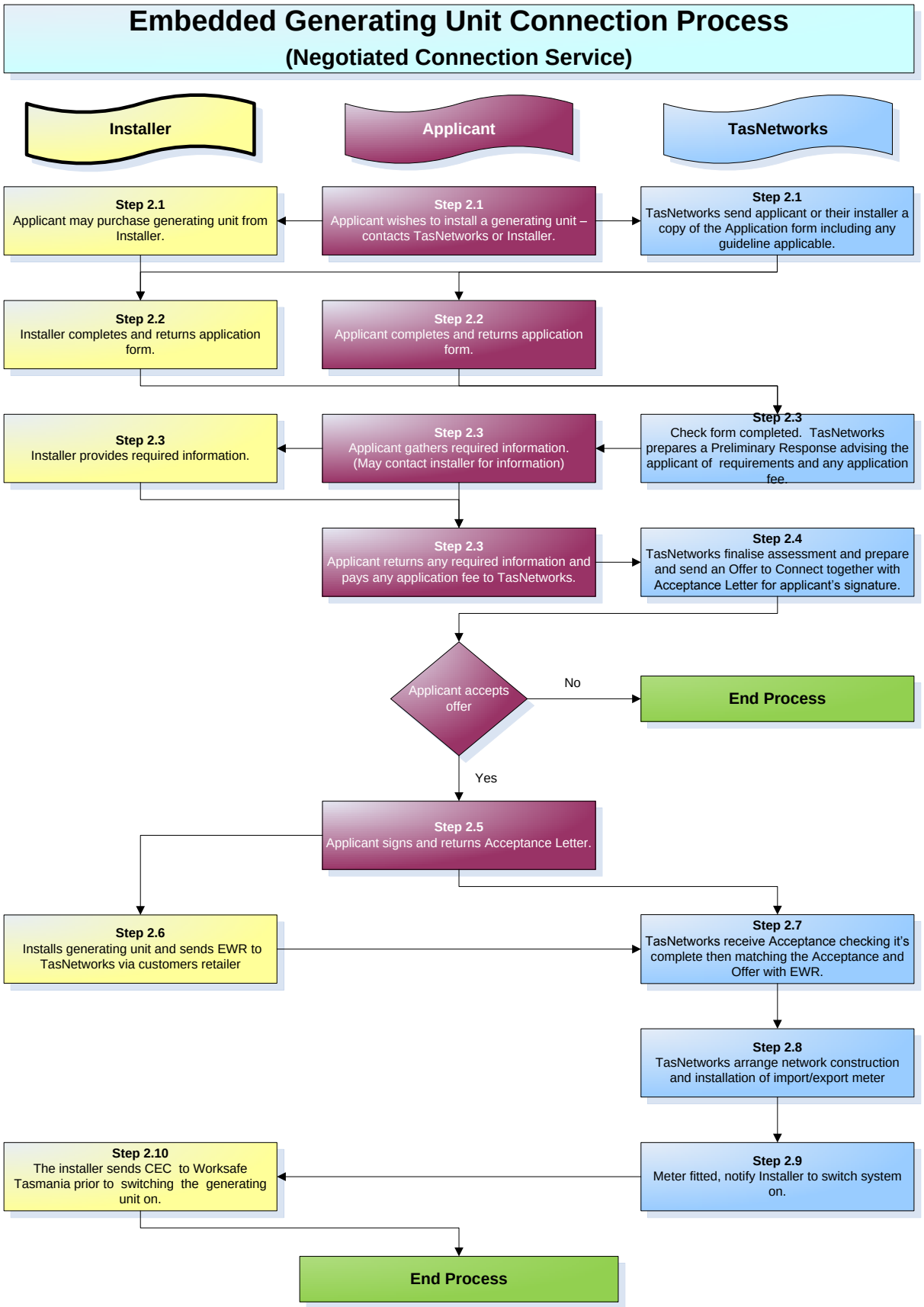
2.9 METER FITTED

Once we have fitted the meter and completed required connection works we will give your installer permission to switch your generating unit on.

2.10 CERTIFICATE OF ELECTRICAL COMPLIANCE PREPARED PRIOR TO SWITCHING SYSTEM ON

Your installer is also responsible for providing a Certificate of Electrical Compliance (CEC) to Worksafe Tasmania prior to switching on your generating unit.

(End of Process)


Embedded Generating Unit Connection Process
(Negotiated Connection Service)
Installer
Applicant
TasNetworks
Step 2.1
Applicant may purchase generating unit from Installer.
Step 2.1
Applicant wishes to install a generating unit – contacts TasNetworks or Installer.
Step 2.1
TasNetworks send applicant or their installer a copy of the Application form including any guideline applicable.
Step 2.2
Installer completes and returns application form.
Step 2.2
Applicant completes and returns application form.
Step 2.3
Installer provides required information.
Step 2.3
Applicant gathers required information. (May contact installer for information)
Step 2.3
Check form completed. TasNetworks prepares a Preliminary Response advising the applicant of requirements and any application fee.
Step 2.3
Applicant returns any required information and pays any application fee to TasNetworks.
Step 2.4
TasNetworks finalise assessment and prepare and send an Offer to Connect together with Acceptance Letter for applicant's signature.
Applicant accepts offer
No
End Process
Yes
Step 2.5
Applicant signs and returns Acceptance Letter.
Step 2.6
Installs generating unit and sends EWR to TasNetworks via customers retailer
Step 2.7
TasNetworks receive Acceptance checking it's complete then matching the Acceptance and Offer with EWR.
Step 2.8
TasNetworks arrange network construction and installation of import/export meter
Step 2.9
Meter fitted, notify Installer to switch system on.
Step 2.10
The installer sends CEC to Worksafe Tasmania prior to switching the generating unit on.
End Process