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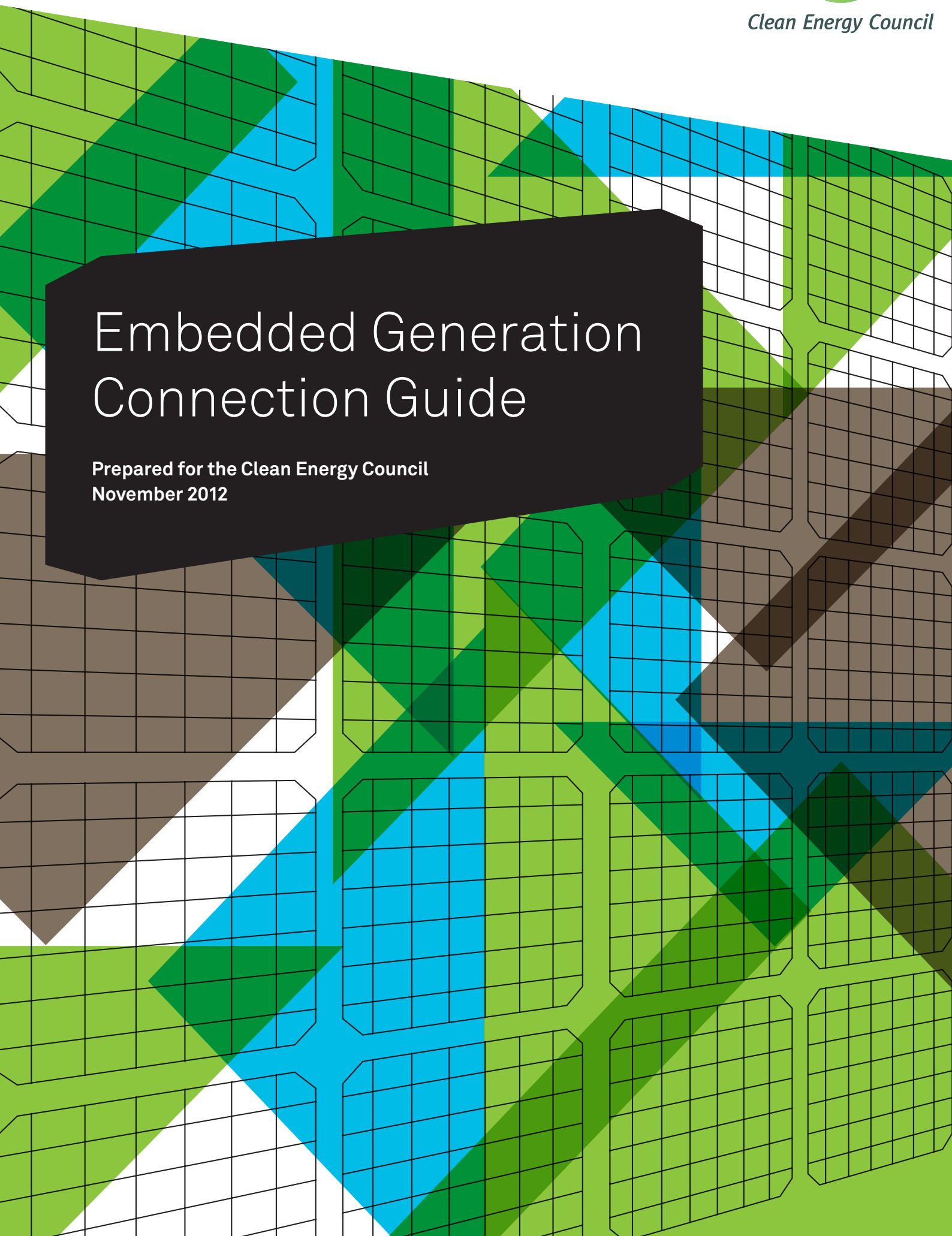
Clean Energy Council

Embedded Generation Connection Guide

Prepared for the Clean Energy Council
November 2012



Prepared for
Clean Energy Council

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Foreword

Australia's Distribution Networks include some 800,000 kilometres of electricity infrastructure delivering electricity to consumers all over Australia. Many of these consumers are located within buildings which need heating or cooling or have large roof areas which could utilise commercial scale solar installations. Embedded generators have the very real potential to transform the way Australia generates and consumes electricity. In doing so they will also change the way our distribution networks are utilised in the long term.

David Green
Chief Executive Officer
Clean Energy Council

It is absolutely essential that embedded generator proponents have access to quality information on which to base their investments. A streamlined approach is needed to ensure that larger embedded generators have a clear understanding of the connection processes which they must adhere to.

This guide has been produced through consultation with Australia's distribution businesses and takes accounts of the relevant rules and guidelines. It is intended to provide embedded generation proponents and developers a starting point for the connection process.

It also contains a number of useful references and process outlines for each distributor which the Clean Energy Council expects will enable project developers to gain an understanding of how to advance their projects from an early stage.

An integrated approach is required through which both distributors and generator work together to create efficiencies which will benefit all consumers in the long term, while ensuring that electricity security and safety are not compromised.

The Clean Energy Council would like to thank all of those who have contributed to the guide. We look forward to a bright and exciting future of distributed energy in Australia.

Peter Wood
Managing Director - Energy
Australia New Zealand
AECOM

Further development of embedded generation projects across Australia presents many opportunities, such as demand-side management of energy usage, reduced greenhouse gases, combined heat and power plants with district energy and additional commercial scale solar energy facilities to name a few.

To successfully achieve these outcomes, proponents need a clear and concise understanding of the connection process and a service provider they can trust.

AECOM is delighted to have developed this publication alongside the Clean Energy Council as the peak body representing Australia's clean energy sector.

Together, by developing renewable sources of energy and reducing energy consumption in the built environment we are helping Australia move to a low-carbon economy.

Developing the clean energy sector requires a collaborative approach that supports innovation while balancing commercial and community needs.

I hope you find this guide a useful tool as part of the development process of realising embedded generation projects.

Acknowledgements

We hope you find this guide to be a useful reference that assists you through the embedded generation connection process. By technical necessity it is a complex and challenging process, but with adequate preparation, insight and technical support it can be navigated successfully.

We would like to acknowledge the support we have received during the development of this guide from:

- Western Power
- Horizon Power
- Aurora Energy
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- SP AusNet
- Jemena
- United Energy
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- AusGrid
- Energex
- Ergon Energy
- ActewAGL
- The Energy Networks Association of Australia

Please feel welcome to contact AECOM or the Clean Energy Council if you have further queries or need additional support during the connection process. We look forward to the expansion of embedded generation in Australia.

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Glossary

A	Amp or Ampere, the measure of Electrical Current
AC	Alternating Current
AEMC	Australian Energy Market Commission (responsible for development of the NER)
AEMO	Australian Energy Market Operator (responsible for the operation of the National Electricity Market on the east coast of Australia)
AER	Australian Energy Regulator (responsible for the regulation of the NEM)
AS4777	Australian Standard for the grid connection of energy systems via inverters
ASP3	Accredited Service Provider Level 3 designer (specific to NSW)
CISA	Connection Investigation Services Agreement (specific to Essential Energy)
DC	Direct Current
DLF	Distribution Loss Factor – a factor around 1 that indicates the losses associated with the operation of a generator or load at a particular connection point on the distribution network
DNSP	Distribution Network Service Provider
DUoS	Distribution Use of System – fees paid to a DNSP for the use of their network
IMOWA	Independent Market Operator of Western Australia (responsible for the WEM Rules and operation of the WEM)
kVA	kiloVoltAmp, the measure of Total Power
kVAr	kiloVoltAmpReactive, the measure of Reactive Power
kW	kiloWatt, the measure of Real Power
kWh	kiloWattHour, a measure of the energy generated by the system
MLF	Marginal Loss Factor – a factor around 1 that indicates the losses associated with the operation of a generator or load at a particular connection point on the transmission network.
NECF	National Energy Customer Framework
NEM	National Electricity Market (the electricity market that includes QLD, NSW, VIC, SA, ACT and TAS).
NER	National Electricity Rules (applying in the NEM)
NSP	Network Service Provider
Power Factor	The ratio of Reactive and Real power in a system
SCADA	Supervisory Control and Data Acquisition
SWIS	South-West Interconnected System (the network located in southern Western Australia)
TNSP	Transmission Network Service Provider
TUoS	Transmission Use of System – fees paid to a TNSP for the use of their network
V or kV	Volt or kiloVolt, the measure of Electrical Potential
WEM	Wholesale Electricity Market (in Western Australia)

01

Intended purpose of this guide

This document is intended to provide a user-friendly guide to those wishing to connect embedded generation in Australian distribution networks. An embedded generator is an electricity generator that is connected to the local electricity distribution network rather than the (higher voltage) transmission network. Distribution networks generally operate supply voltages from low voltage up to 33kV. In some places distribution voltages reach up to 66kV and 132kV. It is designed to apply to generators in the size range 100 kW to 5 MW, seeking to connect to distribution networks. The guide aims to provide an accessible and practical introduction to the connection process in Australia.

This guide is generally not intended to apply to generators that are less than 100kW in size and are able to connect to a network via AS4777 compliant inverters, including solar photovoltaic systems. Despite this, the process for larger generators in this category may be similar to that outlined here. For more information on this, refer to the Clean Energy Council's solar accreditation website. The upper limit of 5MW has been chosen because embedded generation projects less than this limit are eligible to apply for an exemption from being a registered participant in the National Electricity Market (NEM).

Every effort has been made to ensure that this guide is as accurate as possible at the time of writing, but future proponents should make their own enquiries since many aspects are likely to change over time. Some Distribution Network Service Providers (DNSPs) are reviewing their connection processes, so we advise that proponents contact the relevant DNSP as early as possible during project development to ensure the most up-to-date insight is provided.

02

General tips

The following tips provide the main insights you need to navigate the connection process effectively.

- **Begin a conversation with the DNSP early** – DNSPs maintain a staff with the specific role of facilitating new connections. Overwhelmingly, DNSPs encourage proponents to approach them to discuss their proposal at an early stage. This allows them to give insight into the particular challenges associated with the proposed connection location or technology that is being considered, thereby enabling the design and connection process to be effectively managed. In many cases, these informal discussions can circumvent confusion about the process and highlight any early stage risks, in addition to saving time and/or money.
- **Every location is different** – The connection of an embedded generator to a network is highly location dependent. Some locations within a network have particular technical constraints that may require significant investment to overcome. Other locations may actually obtain a benefit from the connection of embedded generation. This is another reason why proponents should talk to the DNSP as early as possible, so that they can provide you with preliminary feedback about the particular location you are interested in.
- **Expect technical complexity** – The connection of a significantly sized generator (>100kW) to a network is technically challenging. By necessity, there will be complex technical discussions to determine exactly how to design and implement the connection.
- **Ensure you have adequate technical support** – Since the conversation with the DNSP will involve technical complexity, proponents should seek assistance if they do not have this capability within their organisation. This will ensure that you are 'speaking the same language', and make the connection process as rapid and simple as possible. It may also enable connection costs to be better managed.
- **DNSPs have responsibilities and cannot compromise on certain requirements** - Under the system rules the DNSP's primary role is to ensure a safe and reliable supply of electricity to consumers, and the connection of new embedded generation cannot override this responsibility. The DNSP needs to ensure that your generator will not adversely affect reliability or power quality of the networks and ensure that the network remains safe for their maintenance personnel, and others. These aspects are not negotiable.
- **Provide information to the DNSP in a concise and accessible format** – If you provide the DNSP with as much clear information as possible, they can make their response as accurate as possible. They appreciate that minimal details will be available at the start, but if you open the conversation with what is available, and update it as you gain further clarity, they can better assist you. Also, often DNSPs only have small teams dealing with a large number of connections projects, so it is recommended that proponents provide the information about their project in a concise and accessible format. If your information changes it's important that you notify the DNSP as early as possible in order to understand the implications of the change. If you don't have sufficient capability within your organisation to manage this, we suggest seeking assistance.

03

Overview of the connection process

3.1 Rules

In Australia, the eastern states (Queensland, New South Wales, Victoria, South Australia, Australian Capital Territory and Tasmania) operate as part of the National Electricity Market (NEM), and therefore are subject to the National Electricity Rules (NER).

The NER defines a detailed overview of the connection process in Chapter 5. Chapter 5A is a recent addition to the NER under the National Energy Customer Framework (NECF) that defines an alternative 'streamlined' connection process for 'micro-embedded generation' which would normally be connected via AS4777 standard inverters. The conditions under which Chapter 5A apply (as opposed to the original Chapter 5) are not clearly specified. At the time of preparing this guide, networks in Tasmania and the ACT have adopted Chapter 5A for all embedded generator connections, while networks in the other NEM regions continue with the connection process defined in Chapter 5 of the NER combined with their own local requirements.

Western Australia is not a part of the NEM, and therefore is not subject to the NER. There are several different power systems in Western Australia:

- **South West Interconnected System (SWIS)** – This network covers the area around Perth, as far north as Geraldton, south to Albany, and east to Kalgoorlie. The network is operated by Western Power, and operates under the Wholesale Electricity Market (WEM) rules. The majority of relevant technical standards for new connections in the SWIS are outlined in Western Power's Technical Rules.
- **North West Interconnected System (NWIS)** – This network operates in the Pilbara region, servicing the communities of Port Hedland, South Hedland, Karratha, Roebourne and Point Samson through the Horizon Power Network. Connections to this network proceed under the process defined by Horizon Power.
- **Regional Non-Interconnected Systems (RNIS)** – the remaining isolated networks in Western Australia are operated by Horizon Power. No prescribed rules apply, although Horizon Power typically applies the NWIS technical rules as a starting point.

The rules applying to new connections in each region are summarised in Table 1.

Table 1 - Connection rules applying in each State/Territory

State/Territory		Connection Rules
QLD		**National Electricity Rules (NER) – Chapter 5** Available on the Australian Energy Market Commission (AEMC) website: www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html
NSW		
VIC		
SA		
ACT		**National Electricity Rules (NER) – Chapter 5A** Available on the Australian Energy Market Commission (AEMC) website: www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html
TAS		
WA	SWIS	**Wholesale Electricity Market (WEM) Rules** Available on the Independent Market Operator (IMO) website: www.imowa.com.au/market_rules.htm **Technical Rules** Available on the Western Power website: www.westernpower.com.au/aboutus/accessArrangement/Technical_Rules.html
	NWIS / RNIS	**North West Interconnected System Electricity Network Access Technical Rules** Available by request from Horizon Power

The following sections provide an overview of the connection process, based on the process outlined in Chapter 5 of the NER. Although some regions are not covered by the NER, the process applied is generally similar across all DNSPs in Australia. It should be noted that the Chapter 5 process was designed for transmission connections and that each DNSP will also usually have their own individual process requirements. Where the connection process with a particular DNSP differs from the outline provided here, the unique characteristics that apply are outlined in section 6, which should be read in conjunction with the following section.

3.2 Overview

Electricity networks developed within the NEM are intended to be operated under an open access framework, where any proponent can apply to the relevant DNSP for a connection to the network. The DNSP is obliged to consider a proponent's project and provide an offer to connect.

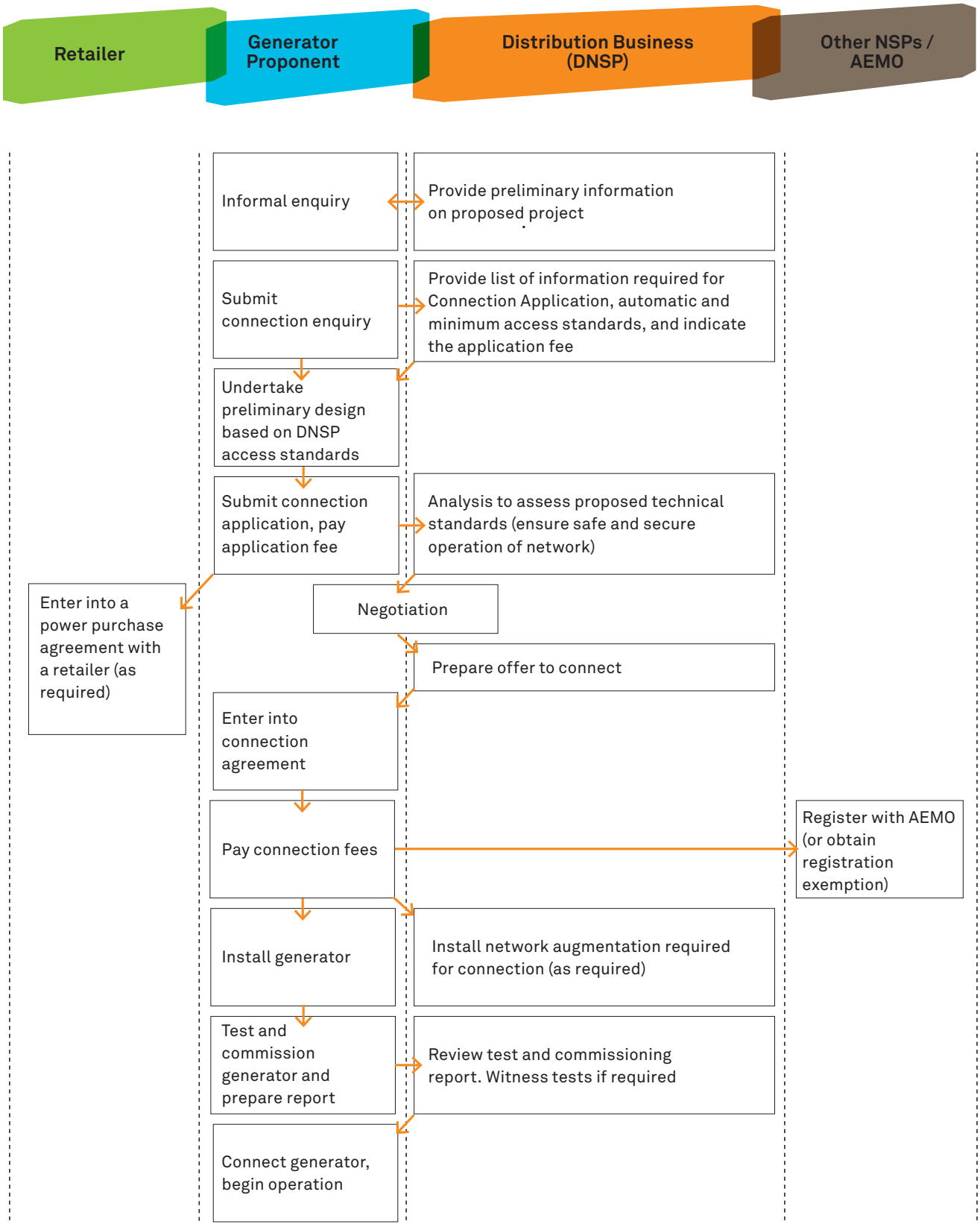
The connection process will vary significantly depending upon how technically challenging the project is. Small generation systems or those that are not expecting to export significant amounts of energy to the grid can generally expect a simplified process. Larger projects, or those connecting at problematic grid locations should be prepared for a more complex process. Even if you don't expect to export any energy to the grid you still need to work through this process with the DNSP.

The connection process typically involves the following stages:

1. **Preliminary connection discussion** – The proponent approaches the DNSP with the concept of what they are trying to achieve, where and by when.
2. **Connection enquiry** – The proponent approaches the DNSP with a formal document outlining the basic information about their proposed project.
3. **Response to connection enquiry** – The DNSP responds with details about the information required for a connection application, and the application fee.
4. **Connection application** – The proponent completes and submits the connection application as per the DNSPs requirements, and pays the application fee. Connection studies would usually be completed as part of the connection application if being completed by the proponent.
5. **Negotiation** – The proponent and DNSP negotiate as to the details of the connection. This will involve negotiation of technical design, as well as commercial details. Connection studies may be undertaken at this stage if being completed by the DNSP.
6. **Offer to connect** – The DNSP makes an offer to connect once all of the technical parameters and commercial details have been agreed.
7. **Connection agreement** – The proponent accepts the offer to connect by signing it and this offer then becomes the connection agreement.
8. **Registration and licencing** – The proponent registers (or obtains registration exemption) with the appropriate market operator and secures any jurisdictional licences required.
9. **Construction/implementation** – The connection assets and the project are physically constructed.
10. **Commissioning and testing** – Following required testing, the plant will be commissioned and connected to the network.
11. **Maintenance** – The proponent will need to demonstrate sufficient ongoing maintenance to meet safety and reliability requirements.

Each of these stages are illustrated in Figure 1 and outlined in more detail overleaf.

Figure 1 – Overview of the connection process



3.3 Preliminary connection discussion

Most DNSPs encourage preliminary discussion or 'pre-connection enquiries' in the form of informal discussions or emails between the DNSP and the proponent. This can greatly assist in the early stages of project development, ensuring awareness of network limitations in the proposed location that may impact the project. Similarly, this informal process can be used to identify if opportunities for the provision of network support may exist (refer to section 3.15).

3.4 Connection enquiry

The formal process begins with the connection applicant making a connection enquiry. This simply involves advising the DNSP of the basic details of the proposed project (type, size, location and timing). The connection enquiry stage is formally required by the NER and the data required is defined in Schedule 5.4 of the NER.

- Type of plant (e.g. gas turbine or engine, small scale wind, cogeneration unit, photovoltaics, etc.).
- Preferred site location – (listing any alternatives in order of preference as well).
- Maximum power generation or demand of whole plant (maximum MW and/or MVA, or average over 15 minutes or similar). This will also include the expected export of the energy from the site, if applicable.
- Expected energy production or consumption (MWh per month).
- Plant type and configuration (e.g. number and type of generating units or number of separate production lines).
- Nature of any disturbing load (size of disturbing component MW/MVAr, duty cycle, nature of power electronic plant which may produce harmonic distortion).
- Technology of proposed generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc).
- When plant is to be in service – (eg. estimated date for each generating unit).
- Name and address of enquirer, and, if relevant, of the party for whom the enquirer is acting.
- Other information may be requested by the Network Service Provider, such as amount and timing of power required during construction or any auxiliary power requirements.

If you are at a stage in your project where you do not know all the information required, you need to discuss the importance of the items that you cannot supply with the DNSP. At this stage proponents may also want to ask the DNSP about whether any other proponents are seeking to connect at the same location, since the timelines and technicalities of those projects will affect your application to connect. This could include other generation projects, or new loads. There may be confidentiality limitations around the provision of detailed data on other connection proponents, but any information that can be provided will be helpful.

3.5 Response to connection enquiry

Once a connection enquiry is submitted, the DNSP is required to respond with further information. The NER specifies that the DNSP should respond within 10 business days with the following information:

- The identity of any other parties that will need to be involved in the planning, or need to be paid for transmission or distribution services, and whether agreements with these parties will be required.
- Whether any service the DNSP proposes to provide (such as the provision of access to the network) is contestable (meaning that it could be provided by another provider or on a competitive basis).
- A preliminary program for the connection process, including proposed milestones.

Under the NER, the DNSP should respond within 20 business days with further information, including:

- Automatic access standards (refer to section 3.5.2)
- Minimum access standards (refer to section 3.5.2)
- Information required in an application for connection. This will include:
  - The connection requirements, including specifications of the facility to be connected.
  - The expectations of the level and standard of service of power transfer capability that the network should provide.
  - Technical data, which may vary depending upon the connection requirements and the type, rating and location of the project. This can be varied by the DNSP to suit the size and complexity of the proposed project.
  - Commercial information, so that the ability of the connection applicant to meet prudential requirements can be assessed.
  - The application fee, which is payable on lodgement of an application to connect.
  - Any other relevant information.

3.5.1 Application fees

DNSPs typically charge a fee to process a connection application. The fee covers the DNSP's expenses in processing your application, and should be no more than is required to cover the reasonable costs of work anticipated by investigating the application to connect and preparing the associated offer to connect, for the DNSP, AEMO, or other network providers that may need to be involved. Some DNSPs have introduced a standard fee structure, while others prefer to quote fees on a bespoke basis. Further details on the arrangements with each DNSP are provided in section 6.

3.5.2 Access standards

The DNSP will provide information on the technical standards (access standards) required to connect to their network. Automatic access standards are technical standards that, if met, are automatically accepted to be 'sufficient' to allow connection. Similarly, minimum access standards are technical standards that must be met as a minimum, in all cases. The parameters required for these standards are defined in the NER in Schedule 5.2.5, and form the basis of the standards applied by DNSPs in the NEM.

Automatic and minimum access standards are defined in the NER for many parameters, some of the key requirements for Embedded Generation are:

- Reactive power capability
- Quality of electricity generated
- Generating unit response to system disturbances
- Protection systems and settings
- Voltage and reactive power control
- Monitoring and control requirements, including requirements for remote monitoring and communications equipment
- Fault current

Meeting the automatic access standards across all technical criteria would allow rapid and easy agreement over connection of the generation project. However, this may be expensive, or unachievable and not required in all cases. This leads to a negotiation process, whereby the proponent proposes a 'negotiated access standard' (at some level in between the minimum and automatic standards). This is then assessed by the DNSP to determine whether it is sufficient in this particular case to ensure the safe and effective operation of the network.

3.6 Connection application

Following response from the DNSP, the proponent may submit an application to connect, including the information that the DNSP has requested. The application fee is to be paid to the DNSP at this time. The application for connection will include a proposal for a negotiated access standard, if the automatic access standard is not met by the proposed arrangements.

The requirements of the connection application will vary between DNSPs, with some having standard forms and others simply specifying the data required to be provided. In general, several documents will need to be completed; these are outlined in Table 2.

Table 2 - Connection application documents

Document Title		Description
Connection Application cover letter		One page document that includes a brief description of the project, and the appropriate contact details.
Connection Application form		Some DNSPs will provide standard forms to be completed, while others will simply specify a list of information to be provided.
Generally not required for projects <5MW, but the requirements of the connection application will vary between DNSPs	Generator Performance Standards	This document outlines how the generator meets the requirements of the system, ensuring that it can safely interact with the DNSP's network. It identifies the limits that the system will work within, and is typically based upon Schedule 5.2.5 of the NER and supported by detailed modelling studies.
	Technical Data Sheets [5]	A series of spreadsheets that illicit technical information about the equipment being used in the installation and grid connection. Example speadsheets which are often used as a basis for DNSP data request formats are available on AEMO's website. It requests four categories of data (S, D R1 and R2), as outlined in Table 3. Only S data is required with the connection application, but if D data is available it is beneficial to include it. R1 and R2 data relate to information that is required to be provided during registration and proven during commissioning tests. These are not generally required for generators <5MW.

The NER provides a list of technical details to be provided with connection applications (and connection agreements) in Schedule 5.5. Technical data is coded in categories, according to the stage at which it is available. The defined categories are listed in Table 3.

Table 3 - Categories of data required during the connection process

Data category	Name	Description
S	Standard Planning Data	Level of data required in the connection application.
D	Detailed Planning Data	Level of data required in the connection agreement. It includes preliminary system planning data plus those items denoted in D in Schedule 5.5.3 to 5.5.5 of the NER.
R1	Registered Data, prior to connection	Data validated and agreed between AEMO, DNSP and proponent. R1 is derived from manufacturers' data, detailed design calculations, works or factory testing, whereas R2 data is derived from on-site system testing during commissioning. These are not generally required for generators <5MW.
R2	Registered Data, after connection	

3.7 Negotiation

Once the DNSP receives a connection application (and the application fee), they will conduct analysis to determine whether the proposed arrangements (in the form of proposed negotiated access standards) meet a sufficient technical standard to ensure continued safe and secure operation of the network.

The NER specifies that the DNSP must respond within 30 business days (following the submission of a proposed negotiated access standard) to accept or reject the proposed negotiated access standard. Negotiated access standards must:

- Be no less onerous than the minimum access standard (provided by the DNSP)
- Not adversely affect power system security
- Not adversely affect quality of supply for other network users

If the proposal is rejected, the DNSP must advise the connection applicant of a negotiated access standard that they would accept. The connection applicant may then reject or accept this alternative proposal, or propose a new standard for consideration by the DNSP.

During these negotiations, the connection applicant must provide any further information that is 'reasonably required' to assess the technical performance and costs of the required connection.

In general, the negotiation process is held in good faith and DNSP connection personnel typically aim to be helpful and guide proponents through the process. To help negotiations go smoothly it is important to ensure that you have adequate technical support to engage effectively. Also, remember that DNSPs have overriding priorities around maintaining the safe and secure operation of their network, and therefore cannot compromise on certain aspects.

If access to DNSP legal personnel is required, this is usually obtained via the nominated DNSP contact point for connections (they will direct you to the correct personnel).

Minor changes to plant design can often be accommodated within the originally quoted application fee, and are anticipated as a typical part of the development of a project. However, any significant change to the proposed project or design, including type or size of generating units, may necessitate rework by the DNSP and therefore delay the response and increase their application fee.

3.7.1 Connection studies

Connection studies are an important part of the connection of any generator to the network. They are intended to provide insight into the impacts of the generator on the network, and to demonstrate the performance of the generator against the relevant technical standards in order to ensure reliable and safe operation of both the generating facility and also the network.

The size of the generating units and the characteristics of the network at the connection point will dictate what studies will be required. Small installations at certain grid locations will not require significant connection studies, while larger projects or those located at problematic grid locations may require more extensive analysis.

Load-flow (or static power-flow) studies are often required, and are conducted in various proprietary software models such as PSS Sincal, Power factory, ETAP, Power Tools for Windows (PTW) etc. These studies are required to demonstrate that the generator will comply with the relevant technical standards and, where necessary how the generator and its control systems will react to disturbances on the network. A range of data is usually required as input to these models, including but not limited to:

- Type of generation and fuel source
- Size and number of generating units
- Connection voltage
- Earthing arrangement
- Control equipment for generators
- Mode of operation (power factor or voltage source)
- Proposed duration of operation – peak demand, 24 hours/day
- Size and impedance of transformers
- Protection design and settings
- Power quality parameters

Some DNSPs prefer to undertake the required studies internally, and will charge a fee for completing those studies (often as a part of the connection application fee). Where this is the case, some DNSPs will provide you with an agreement that outlines their obligations in undertaking those studies, including the timeline over which they will be completed. Others will simply enter your study into a 'queue' of work, and it will be completed when possible. The outcome of these reports will inform the proponent if they can connect or not.

Other DNSPs prefer for proponents to undertake these studies at their own cost. In this case, the proponent will need to provide the DNSP with a comprehensive report that outlines all the input data used, the assumptions that were made, and the results of the studies. The DNSP will conduct a due diligence process on your analysis, ensuring that they can replicate your results, and that they are sufficiently detailed. The specific requirements around connection studies for each DNSP are outlined in section 6.

3.7.2 Interface requirements

The aspects of most concern to the DNSP are likely to be around the interface between your generator and the DNSP's network. In particular, they will likely specify detailed requirements associated with the following:

- Protection to ensure grading and discrimination of protective devices
- Supervisory control and data acquisition (SCADA) so the DNSP has visibility of circuit breaker status, operation of generators, voltage levels, generation export (kWh and kVAr)
- Communications for protection, remote control or inter-tripping.
- Metering, as the proponent has a choice of Meter Provider (for installation) and Meter Data Agent (for collection of meter data) within the NEM. The accuracy of metering required (Type) is dependent on the volume of energy throughput (less than 5MW generation will be limited to Type 4 metering). Bi-directional metering will be required where the generators are embedded within a building and export excess generation to the grid.

These requirements may vary depending on the voltage level, architecture of the connection and existing network capability where you are connecting in the network, and the nature of the project you are proposing.

3.8 Offer to connect

Once the connection arrangement, technical access standards, scope and responsibility of works are agreed, the DNSP prepares an offer to connect – often this is the connection agreement. The offer to connect must be 'fair and reasonable' and should include the proposed terms and conditions for connection to the network, including the basis for determining distribution service charges.

The offer to connect should be made within the time period specified in the preliminary program provided as part of the connection enquiry response noted in Section 3.4, unless negotiations have taken longer than anticipated.

At this stage, the DNSP should use all reasonable endeavours to advise the connection applicant of all risks and obligations in respect to the proposed connection associated with any relevant planning and environmental laws.

It is the DNSPs responsibility to determine whether the proposed connection is likely to affect AEMO or any other registered participants with whom they have connection agreements, and to liaise with them regarding those impacts.

3.9 Connection agreement

If the connection applicant wishes to accept the offer to connect, they then enter into a connection agreement with the DNSP.

The structure and number of documents of a connection agreement will vary between DNSPs. A complete connection agreement is typically split into two areas:

- Terms and Conditions, prescribing the arrangement of the agreement
- Technical Schedules, which contain all the operating, control, interface and technical areas pertaining to the facility.

It will also contain the details of any ongoing fees to be paid by the embedded generator or any ongoing payments to be made by the DNSP to the embedded generator for services provided. Table 4 outlines components that might typically be included in a connection agreement.

DNSPs are generally low risk organisations; however, they are open to discussing any pertinent issues that the proponent may have relating to the terms and conditions of a connection agreement and negotiating accordingly, without compromising their obligations as a DNSP.

Table 4 - Typical components of a connection agreement

Component	Description
Terms and Conditions	
Network Services	Outline of the services to be provided by the DNSP Requirements of the generator to facilitate the provision of such services
Insurance	Insurance requirements of the proponent
Liabilities	Limit of liabilities of both parties
Variation to the charges	Outline of the conditions under which there might be a variation in charges
Taxes	Clarification of the ownership of government tax imposed on both sides
Dispute resolution	Process for resolution of disputes
Contract termination and extension	Provision for termination or extension of the contract
Notices	Process for issuing of notices
Technical Schedules	
Scope of works	Definition of each element of works to facilitate connection and identification of the responsible party for each element.
Term	Agreed connection date and duration of the agreement
Technical standards	A description of the technical standards that the generator will meet, including each of the aspects listed in section 3.5.2
Operating asset management	Definition of the generator's property boundary and equipment management (maintenance schedules, etc)
Access, inspection	Arrangements for access onto the generator's property (for metering, maintenance, etc)
Metering	The agreed provisions around metering, equipment rule, procedures for testing and inspection and metering data
Network protection	Outlines the network protection requirements
Testing and commissioning	Testing and commissioning procedures that will be applied
Fees and payments	Outlines the application fee, connection fees and the process for managing any other project fees levied by a third party Also outlines any ongoing payments to be made by the DNSP to the embedded generator for services provided
Technical reports	Reports pertaining to technical studies or detailed design carried out by the proponent

Connection can be made provisional upon the DNSP obtaining the required environmental and planning approvals for a required augmentation, and the responsibility for obtaining these approvals may be assigned to the connection applicant (where permitted by applicable law).

3.10 Registration

In general, generators connecting in the National Electricity Market must register (or obtain a registration exemption) with the Australian Energy Market Operator (AEMO). AEMO provides forms and guidelines for registering on their website, as outlined in Table 5. However, AEMO has specified that small generating facilities (with a nameplate rating of less than 5 MW) are automatically exempt from the requirement to register as a generator, as outlined in Table 5. If you are in doubt as to whether your generating system meets the required criteria for automatic exemption, you can submit an Application for Exemption from Registration as a Generator for AEMO's consideration.

Exemption means that you are not required to pay participant fees and do not have to participate in the energy market. Exemption from registration also exempts the generation project from involvement by AEMO in assessing detailed technical matters, thereby limiting the technical assessment of the generator to the connecting DNSP. The requirements of this assessment are covered above in Section 3.5.2.

Notwithstanding the above, if any generator wishes to participate in the energy market, registration is compulsory.

Proponents in Western Australia connecting to the SWIS should register with the Independent Market Operator (IMO). Proponents in Western Australia connecting outside of the SWIS should discuss operational arrangements with Horizon Power.

Table 5 - Generator registration

State/ Territory	Where to apply	Exemptions
QLD, NSW, ACT, VIC, SA, TAS	Australian Energy Market Operator (AEMO) www.aemo.com.au/en/About-AEMO/Energy-Market-Registration/Registering-in-Energy-Markets#electricity	Systems that satisfy any of the following conditions are automatically exempt from the requirement to register: • The generating system has a total nameplate rating at a connection point of less than 5 MW. • The generating system is not capable of exporting to a transmission system or distribution system in excess of 5 MW. • The generating system has no capability to synchronise or to operate electrically connected to a distribution system or transmission system. • The sent out generation of the generating unit is purchased in its entirety by the local retailer or by a customer located at the same connection point.
WA (SWIS)	Independent Market Operator (IMO WA) www.imowa.com.au, go to "Registration Information": www.imowa.com.au/n144.html	All generators greater than 5kW must register with the IMO, or apply for an exemption. Registration categories are as follows: • Scheduled – All non-intermittent generators greater than 10MW – Non-intermittent generators in the range 200kW to 10MW (optional) • Non-scheduled – All intermittent generators greater than 5kW – Non-intermittent generators in the range 200kW to 10MW (optional)

3.11 Licensing

Depending on which state your project is connecting in, you may also be required to apply for a generator licence from the relevant authority. Details for each state are outlined in Table 6.

Table 6 - Licensing bodies

State / Territory	Details	Relevant Authority
QLD	Under section 130 of the Electricity Regulations, 2006, a generating plant with a capacity of 30MW or less is automatically deemed to hold a 'special approval', and therefore does not need to hold a Generation Authority licence.	**Department of Energy and Water Supply, Queensland Government** Energy Sector Monitoring: 07 3898 0694 PO Box 15456, City East, Qld, 4002 www.business.qld.gov.au/industry/energy/electricity-industry/electricity-regulation-licensing/electricity-licensing www.business.qld.gov.au/__data/assets/pdf_file/0016/9124/application-guidelines-special-approval.pdf
NSW	There are no generator licensing requirements in NSW.	**Independent Pricing and Regulatory Tribunal (IPART)** Program Manager, Energy Compliance: 02 9113 7732 Level 2, 44 Market Street, Sydney NSW 2000 PO Box Q290, QVB Post Office NSW 1230 www.ipart.nsw.gov.au/Home/Industries/Electricity/Licensing
ACT	There are no generator licensing requirements in the ACT	**ACT Independent Competition and Regulatory Commission** 02 6205 0799 icrc@act.gov.au Level 8, 221 London Circuit, Canberra ACT 2601 PO Box 161, Civic Square ACT 2608 www.icrc.act.gov.au/
VIC	Can apply for an exemption (no automatic exemptions)	**Essential Services Commission** Victoria's Independent Economic Regulator of Essential Services Regulator of Essential Services: 03 9651 0222 Level 2, 35 Spring Street, Melbourne Victoria 3000 www.esc.vic.gov.au/Energy/Licensing www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubStatbook.nsf/f932b66241ecf1b7ca256e92000e23be/4fc2a8645c6e1e8fca256e5b00213f45/$FILE/00-068a.pdf

State / Territory	Details	Relevant Authority
SA	The following generators are exempt from the requirement to hold a generation licence: • a generator whose generating plant has a rated nameplate output of 100kVA or less; • a generator that does not supply electricity for reward to or by means of a transmission or distribution network; ESCOSA can issue a licence exemption on a case by case basis, but will only do so in exceptional circumstances where licensing is not appropriate.	**Essential Services Commission of South Australia (ESCOSA)** Manager, Legal and Licensing: 08 8463 4444 licensing@escosa.sa.gov.au GPO Box 2605, Adelaide SA 5000 www.escosa.sa.gov.au/electricity-overview/licensing.aspx www.escosa.sa.gov.au/library/120724-Licence-ApplicationElectricityGeneration.pdf www.escosa.sa.gov.au/library/120724-AdvisoryBulletin4_ElectricityAndGasLicensing.pdf
TAS	A person must not carry out operations in the electricity supply industry in Tasmania for which a licence is required unless the person holds a licence authorising the relevant operations. Installed generation capacity less than 5 MW are not charged a licence fee.	**Office of the Tasmanian Economic Regulator** Enquiries regarding licence applications: 03 6233 6204 office@economicregulator.tas.gov.au Level 5, 111 Macquarie Street, Hobart GPO Box 770, Hobart Tas 7001 www.energyregulator.tas.gov.au/domino/otter.nsf/elect-v/019 www.energyregulator.tas.gov.au/domino/otter.nsf/8f46477f11c891c7ca256c4b001b41f2/db87b09c70d1776dca256cd3001d0c14?OpenDocument
WA	A generator is exempt from the need to hold a licence for: • generation works under 30MW • on-supply to commercial or residential premises • if the relevant generating works is used for the supply of electricity solely for the consumption of the person who owns or controls the works or system.	**Economic Regulation Authority** Executive Director – Licensing, Monitoring and Customer Protection: 08 6557 7900 Level 4, 469 Wellington Street, Perth WA 6000 Applications for licence exemption should be made to **The Office of Energy**: 08 9420 5600 Level 9, Governor Stirling Tower, 197 St Georges Tce, Perth WA 6000 www.erawa.com.au/1/79/51/electricity_licensing.pm www.erawa.com.au/2/420/51/electricity_licensing__licensing_information.pm?s=1 www.erawa.com.au/cproot/10013/2/20111101%20-%20D63311%20-%20Final%20Electricity,%20Gas%20and%20Water%20Licences%20Application%20Guideline%20and%20Forms.pdf

3.12 Commissioning and testing

The proponent will be required to undertake suitable tests during commissioning to confirm correct and proper operation of all protection, control, metering and monitoring systems associated with the generator installation. Some DNSPs may require their personnel to be present for witness testing of protection systems, while others will be satisfied by the provision of a verified copy of test results in a test report upon completion.

The process of commissioning and testing a distributed generation system can be technically complicated and time consuming. It is important that you develop your commissioning plan early and have appropriately qualified and experienced technical assistance within the area of plant commissioning.

3.13 Maintenance requirements

The connection applicant is usually required to supply the DNSP with their proposed maintenance program during the connection negotiation process. The DNSP will be particularly seeking confirmation of appropriate maintenance of protection, control and monitoring equipment. From time to time the DNSP may request evidence of compliance with these programs, such as results from maintenance test reports.

3.14 Connection timelines

The size and location of the embedded generating unit will determine the complexity and hence timescale of the connection process. For example, a 500kW generator, with no export to the network, located within a building that is connected to an 11kV urban or CBD network will be a lot simpler to assess and process compared to a Greenfield 3MW generator whose energy is fully exported to the grid that is connecting to a rural network.

There are currently minimal obligations on the NSPs under chapter 5 of the NER regarding the provision of timely responses. The connection enquiry process stipulates responses should be received with 10 and 20 business days. However, there are no obligations to provide an offer to connect within a specified timeline. Chapter 5A does have further obligations depending whether the proponent wishes to receive a standard connection offer – 10 days after receiving a completed connection application. Or a negotiated connection offer should be made within 65 days of receiving a fully completed and acceptable connection application; any additional requests from the DNSP will reset the 65 day timeline. The implementation of Chapter 5A and NECF has been delayed in many jurisdictions at the time of writing. However, most of the NSPs are transitioning their processes to align with this timeframe.

The implications of the chapter 5A timescales mean that the various planning reports, concept design and technical studies must be completed prior to submitting the connection application.

Typical timescales for these studies are:

- Planning report (investigation into viable connection options) – 4-8 weeks
- Concept report (concept design for chosen connection option) – 8-12 weeks
- Project scope report (estimation of chosen connection option) – 8-12 weeks
- Technical studies - (to support connection application) – 8-16 weeks
- Connection Application process by DNSP (up to 65 days) – up to 13 weeks

Therefore, depending on complexity, the overall timescale may take between 32-60 weeks before an offer to connect is received by the proponent. Physical connection works cannot proceed until the connection agreement has been finalised.

3.15 Network support

In some network locations, the connection of a new embedded generator can allow deferment of network augmentation, or provide other valuable support to the network. In these situations you may be able to negotiate for your project to provide network support in exchange for network support payments.

Bear in mind that network support is only likely to be relevant in locations where the network is close to capacity and network augmentation is imminently required. Under the NER, DNSPs are required to publish regulatory test consultations outlining locations where major augmentations are required, and the type of embedded generation that may be able to delay that investment. For example, refer to the list of regulatory test consultations published by Ergon Energy.

In order to be eligible for network support payments you will need to be able to provide assurance that your generator will operate when required (usually at times of peak network demand). The DNSP is required to meet reliability standards, and to achieve this they require confidence that your generator will be available and operating when required. Stringent technical standards typically apply, including demonstration of a high level of availability, fast start characteristics and continuous fuel supply.

In order to receive network support payments you will need to enter into a specific contractual arrangement and failure to meet contracted obligations would usually result in a financial penalty. As this penalty may be significant it is worthwhile obtaining commercial support to facilitate negotiations for network support contracts.

3.16 Provision and use of information

Under the NER, DNSPs are required to provide proponents with the technical information required to facilitate the processing of their connection enquiry or application to connect (Clause 5.3.2(f)). Most DNSPs are able to provide you with detailed information regarding their network so that you can get a competent technical advisor to complete the required network studies and analysis. They are not able to supply information concerning other connections and their intellectual property. The requests for this data need to be focussed on the location and the level of detail required to ensure compliance to the technical requirements of the DNSP. It is important to ensure that you have adequate technical support in your team to ensure that the right questions are asked of the DNSP. The types of data that are usually available are:

- Network models for high and low demand times
- Voltage control scheme information
- Network diagrams
- Fault level information
- GIS information of the network

All data and information provided by both the DNSP and connection applicant during the application process is confidential, and must not be disclosed by the recipient to a third party. AEMO and other NSPs for whom the information may be materially relevant are an exception to this.

If either party becomes aware of any errors or changes in the data provided during the process, they must promptly notify the other party of that change. If there are changes to data provided to AEMO, corrections must be provided within five business days (under Chapter 5 of the NER).

3.17 Dispute resolution

If you encounter a situation where you believe dispute resolution may be required, we recommend first aiming to resolve the issue via discussion with the nominated DNSP personnel, and if necessary seeking third party support (preferably a technical specialist in network connections). There may also be a need to escalate issues within the DNSP and involve their customer complaints groups. Most issues that arise during the connection negotiation are highly technical in nature, so it is important to ensure that you have adequate technical capacity within your team to engage in this process effectively.

The Australian Energy Regulator (AER) may consider and make determinations regarding customer connection complaints and disputes with electricity distribution businesses. Connection disputes arise when a customer seeks connection to an electricity distribution network, and is unable to reach agreement with the DNSP on the terms and conditions of the connection offer. The AER is responsible for resolving electricity distribution customer connection disputes under Part 10 of the National Electricity Law. Dispute resolution processes are outlined in detail in Chapters 5A and 6 of the NER (refer to Chapter 6, Part L).

3.18 More information

We recommend talking directly to the relevant DNSP (for information on identifying the relevant DNSP, refer to Section 5). They can provide you with further documentation outlining their specific process in detail (we have provided a subset of tips for each DNSP in Section 6).

AEMO also provides further information on their website for generators connecting in the NEM in their document "Connecting New Generation – A Process Overview". This was last updated in April 2011.

The Energy Networks Association has also recently prepared a document that provides further information on the connection of embedded generation, entitled "ENA Guideline for the preparation of documentation for connection of Embedded Generation within Distribution Networks" (May 2011). Although this document has been written for DNSPs to help develop consistency between their documentation and connection processes, it does contain valuable information that may be of assistance to connection proponents.

04

Potential issues

The potential issues that can be encountered in the connection of embedded generation are numerous, and depend greatly upon the specific location and proposed project. However, some commonly encountered issues are outlined in Table 7. If you suspect that these issues may apply to your project you may want to seek technical assistance during the planning and design phases.

Table 7 - Potential issues encountered with connection of embedded generation

Potential issue	Where typically encountered	Possible solution
Voltage fluctuation issues	Regional areas	There is no easy fix for the issues of voltage fluctuation at the end of long regional powerlines. Usually this will need to be modelled to ensure that the generator is able to sustain its output while the network voltage fluctuates. Voltage fluctuations may also occur in the event of the generating facility tripping off supply, or if the generator's output fluctuates rapidly.
Steady state voltage levels	All areas	The connection of embedded generation will impact on the voltage levels on the connecting network. High voltage distribution networks have some degree of dynamic voltage control, but low voltage networks do not. Therefore, any changes to the high voltage network will impact the low voltage network and studies will be needed to make sure that low voltage customers are not affected. Voltage control schemes can become technically challenging, particularly in rural distribution networks. These networks are often characterised as 'weak' networks and can incorporate a complex voltage control scheme. This can become a significant barrier to rural embedded generation connections if not managed appropriately.
Fault level issues	CBD areas	In CBD areas there are issues with the high levels of fault current that occur under fault conditions. This is caused by the specific network configurations. The main method for overcoming this issue is the addition of a fault current limiter in the setup of the system, but this can become an expensive fix for some specific projects.
Export of energy to the distribution network	All areas	If a project is intending to export energy into the distribution network it may make the connection more difficult. This is due to the extra impact the export of energy into the network can have.
Generator stability while connected to the network	All areas	This issue can usually be overcome by the addition of a pole slip protection relay so that the generator will remove itself from the network if it becomes unstable.
Communications for intertripping	Regional areas	Given the need for some DNSPs to have a dedicated intertrip signal from your generator to their control centre it is possible that the DNSP may require dedicated fibre optic cable communication. This can be expensive and can often be overlooked and create a surprise expense for your project. If there is a need for intertripping for your project it is best to determine the method for this as early as possible.

05

Identifying your DNSP

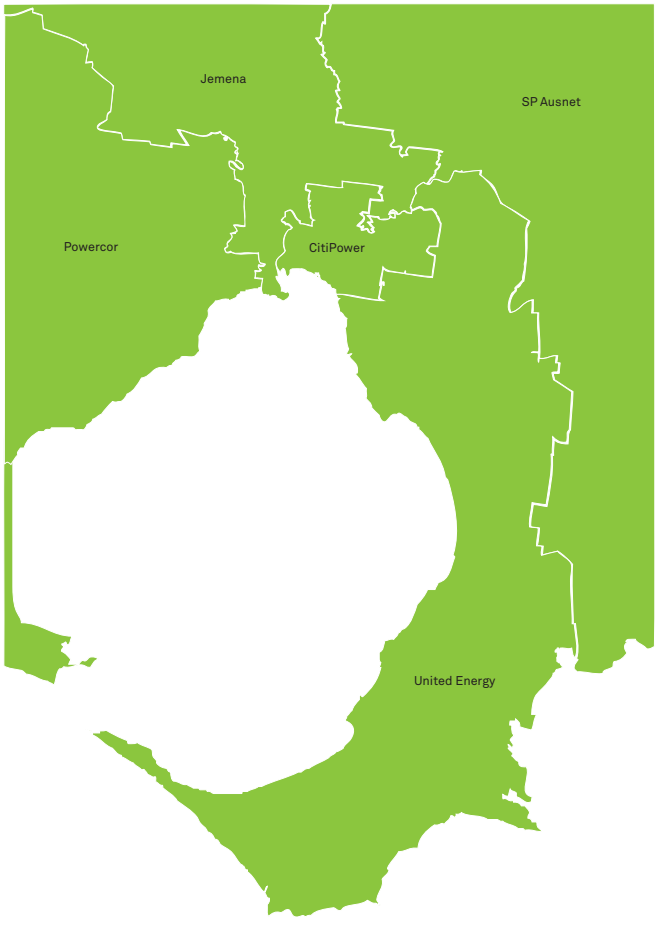
Distribution networks are operated by different organisations in each state, as listed in Table 8. In order to begin the connection process you will need to identify which DNSP operates the network in the area where you wish to connect.

Table 8 - Identifying your DNSP

State/Territory	DNSPs	Notes
ACT	ActewAGL	All distribution in ACT
NSW	Essential Energy	Regional NSW
	Ausgrid	Northern Sydney
	Endeavour Energy	South west of Sydney
QLD	Energex	South-East Queensland
	Ergon Energy	Regional QLD (NEM and standalone networks)
SA	SA Power Networks (formally ETSA Utilities)	All distribution in South Australia
TAS	Aurora Energy	All distribution in Tasmania
VIC	CitiPower	Melbourne CBD
	Powercor	Western Victoria
	Jemena	Western inner Melbourne
	SPAusNet	Eastern Victoria
	United Energy	Southern inner Melbourne
WA	Western Power	Western Australia South of Kalbarri (SWIS)
	Horizon Power	Rural standalone networks, including the Pilbara

Figure 2 - Map of the Distribution Network Service Providers in Australia

Figure 3 - Map of the Distribution Network Service Providers in and around Melbourne, Victoria



06

Information specific to connection

Following from the general description of the connection process provided in Section 3 this section further develops the requirements on both a state and specific DNSP basis. The information provided in this section was developed through a process of document review and interviews with the DNSP. The information provided within this section is current at the time of writing.

6.1 Queensland

Since July 2010 the DNSPs (Ergon Energy and Energex) have introduced changes to the delivery mechanism for dedicated connection assets.

Work carried out on the shared network, can only be performed by the DNSP under a Standard Control Services (SCS) framework, these assets are billed through network charges to all network customers. A customer whose project requires dedicated connection assets has three options on how the dedicated assets are constructed and owned, these are Alternate Control Services (ACS):

- The DNSP can build, own and operate the connection assets
- The proponent can build, own and operate the connection assets
- The proponent can build the connection assets and transfer them to the DNSP for ongoing operation and maintenance

Although the new requirements of NECF and Chapter 5A of the NER have not been implemented in Queensland yet, both Ergon Energy and Energex are transitioning their connection process to meet with the NECF requirements.

The implications of this for new projects are for the concept and planning studies to be carried out prior to the connection application. Only when a known connection option and solution has been agreed between the proponent and the DNSP is the connection application submitted. An offer to connect is then returned within 65 days.

The relevant state specific codes can be found in Table 9.

Table 9 - Specific jurisdictional area codes and service installation rules for QLD

State/ Territory	DNSP	Local Codes/Rules
QLD	Energex Ergon Energy	Queensland Electrical Safety Act 2002 www.legislation.qld.gov.au/legisltn/current/e/electricalsa02.pdf Queensland Electricity Act 1994 www.legislation.qld.gov.au/legisltn/current/e/electrica94.pdf Queensland Electricity Connection and Metering Manual www.energex.com.au/contractors-and-service-providers/electricity-connection-and-metering-manual

6.1.1 Energex

Table 10 Energex contact details

Website	www.energex.com.au/residential-and-business/changes-to-your-connection-necf/solar-pv-micro-embedded-generator
Position to contact	Network Commercial Manager
Email	lcc@energex.com.au
Phone	General Enquiries: 07 3664 4000 Large Customer Connections: 07 3407 5863
Useful Forms	Prefeasibility Enquiry Form www.energex.com.au/upload/technical_documents/20120910_114508_4249231.pdf Embedded Generation Enquiry Form (for the Connection of Embedded Generators >30kW) www.energex.com.au/upload/technical_documents/20120910_114559_8574335.pdf Network Connection Application: Embedded Generation www.energex.com.au/upload/technical_documents/20120816_105504_9912226.pdf
Useful Documents	All technical documents: www.energex.com.au/service_providers/technical_docs/asp/technical_documents.asp Guide to Lodging a Large Customer Connection Enquiry, Energex, August 2012 www.energex.com.au/upload/technical_documents/20120824_140223_1590387.pdf Large Customer Connection Manual, Energex www.energex.com.au/upload/technical_documents/20120717_122527_2084314.pdf Customer Standards for Small to Medium Scale Embedded Generation, Energex, Jan 2012 www.energex.com.au/upload/technical_
Modelling of effects of generator on system	Proponent to complete studies, Energex will review the results

Process differences
The focus for connection of generators to the Energex network is to ensure that it is safe and reliable with limited impact on the quality of supply in the network. The Energex website contains connection information documents that are a great resource when connecting to this network.

Construction and delivery of the connection assets are at the discretion of the proponent as described above.

Fees and timelines
Energex will charge for prefeasibility studies to cover their costs associated with the identification and investigation of connection options and technical studies associated with a project. These are charged on a schedule of rates basis and quoted on project specific requirements.

The above document, *Customer Standards for Small to Medium Scale Embedded Generation,* (Energex Jan 2012), states approximate timescales for a proponent to receive and offer to connect following receipt of a completed Connection Application is between 3-18 months dependent on the location and voltage of connection.

6.1.2 Ergon Energy

Table 11 – Ergon energy contact details

Website	www.ergon.com.au/your-business/connections/
Position to contact	Generation Connections Manager
Email	majorconnections@ergon.com.au
Phone	Major Connection Manager: 07 4727 5710
Useful Forms	Major Customer Connection Enquiry Form www.ergon.com.au/__data/assets/pdf_file/0012/102216/MCC-Enquiry-Form-Aug-2012.pdf Major Customer Connection Application to Connect www.ergon.com.au/__data/assets/pdf_file/0011/102215/Major-Customer-Connection-Guideline-Oct-2012.pdf
Useful Documents	Major Customer Connection Guideline www.ergon.com.au/__data/assets/pdf_file/0011/102215/MCC-Guideline-Aug-2012.pdf
Modelling of effects of generator on system	Although the process allows for proponents to appoint their own technical consultants to carry out the various planning and concept reports, Ergon Energy will normally undertake technical analysis of new connections.

Process Differences
Ergon Energy is particularly keen to ensure that new projects are discussed with them early so that they can outline their requirements and expectations up front. The implementation of the major customer connection guideline on their website is still in transition and being established and should be referred to before making contact with Ergon Energy.

The process follows three steps prior to the connection application

1. Planning report – Looks at all viable options for connection and provides information of what you need to know for your project
2. Concept report – Concept design for your identified connection solution – provides you information on what needs to be built
3. Project scope report – Cost estimated and development of charges applicable to your connection.

Fees and Timelines
The above three steps each require separate payment, which are calculated on a bespoke basis dependent on complexity and voltage of connection. This covers the requirements and costs of the works that Ergon Energy or an external consultant will complete for the connection. The costs associated with the works undertaken by Ergon Energy will be charged on a schedule of rates basis.

Approximate timing for the three stages are:
1. Planning report – 6 – 8 week
2. Concept report – 8-12 weeks
3. Project scope report – 8-12 weeks

Including the Connection Application process and offer to be provided by Ergon Energy an allowance of 9 to 12 months should be made for new connections.

6.2 New South Wales

The specific items that are of interest for connections in New South Wales are:

- The DNSP's do not complete any of the design or construction works for connections works within NSW. These works are considered as contestable works. Contestable works need to be designed by an Accredited Service Provider Level 3 (ASP3) designer before connection to a network in NSW is allowable. More information on contestable works can be found at www.trade.nsw.gov.au/energy/electricity/network-connections/contestable
- New South Wales is likely to be the next state to convert to the requirements of NECF and Chapter 5A of the NER. At the date of writing the exact changeover date was unknown but each of the DNSP's have highlighted that this changeover will require changes to their processes.

The relevant state specific codes can be found in Table 12.

Table 12 - Specific jurisdictional area codes and service installation rules for NSW

State/ Territory	DNSP	Local Codes/Rules
NSW	Essential Energy Ausgrid Endeavour Energy	NSW Electricity Supply Act 1995 www.legislation.nsw.gov.au/sessionalview/sessional/act/1995-94.pdf Service and Installation Rules of New South Wales www.trade.nsw.gov.au/energy/electricity/network-connections/rules EA (Ausgrid) documentation: NS, CIA and NSA series

6.2.1 Ausgrid

Table 13 - Ausgrid Contact Details

Website	www.ausgrid.com.au/Common/Our-network/Network-connections.aspx
Position to contact	Grid Connection Officer
Email	Sydney and Tuggerah: ea.datanorth@ausgrid.com.au Muswellbrook: ea.datamuswellbrook@ausgrid.com.au
Phone	Muswellbrook: 02 6542 9017 Wallsend: 02 4951 9930 Central Coast: 02 4325 8537 Hornsby: 02 9477 8201 Oatley: 02 9585 5774
Useful Forms	Application Forms: • ES1 Form A – Application for Connection • ES1 Form B – Supplementary Application for Connection www.ausgrid.com.au/Common/Our-network/Standards-and-Guidelines/Electrical-supply-standards.aspx
Useful Documents	Connection of Embedded Generators, Ausgrid, August 2008, www.ausgrid.com.au/~/media/Files/Network/Documents/NS%20and%20NUS/NS194_NSA.pdf Requirements for Connection of Embedded Generators, Ausgrid, July 2011, www.ausgrid.com.au/~/media/Files/Network/Documents/ES/ES11_22Jul2011.pdf
Modelling of effects of generator on system	Ausgrid carry out the technical studies for the connection of embedded generators to their network

Process differences
In general Ausgrid follows the process outlined in Section 3. The focus for connection of generators to the Ausgrid network is to ensure that it is safe and reliable with limited impact on the quality of supply in the network. The Ausgrid connection information documents are a great resource when connecting to this network.

Fees and timelines
There is no predefined standard for fees charged for a connection application and they will vary depending on the size and complexity of the connection. In general Ausgrid have two levels of fees as follows:

- Enquiry fees – these need to be paid at the connection enquiry stage and are usually a few thousand dollars.
- Application fees – these are paid with the connection application and cover the works that Ausgrid need to complete as part of the connection process. These fees are generally between $20–30,000.

The fee structure will be part of the initial discussions with Ausgrid and will need to be agreed early in the project.

The timing of the connection process is also dependant on the location and size of the embedded generator. For smaller simple projects the time to complete the process can be a few months while more complex projects that require an iterative process can take up to 18 months.

6.2.2 Endeavour Energy

Table 14 - Endeavour Energy contact details

Website	www.endeavourenergy.com.au/wps/wcm/connect/EE/NSW/NSW+Homepage/ourNetworkNav/Network+connections/
Position to contact	Contestable Works Administration
Email	connection.enquiries@endeavourenergy.com.au
Phone	02 9853 7977
Useful Forms	Application for Connection of a Generator (FPJ7000) www.endeavourenergy.com.au/wps/wcm/connect/2a9ef7804b5e8c28bb74fb69643c1f91/FPJ+7000.pdf?MOD=AJPERES Standard form customer connection contract (July 2012, version 6.3) http://www.endeavourenergy.com.au/wps/wcm/connect/408767004701a9a18a5ccf23afe1452b/SFCCC_July_2012+_v63.pdf?MOD=AJPERES
Modelling of effects of generator on system	Endeavour Energy will generally complete the required technical studies. However, if there are complex issues relative to the connection location such as stability of the network these may be performed by the proponent.

Process differences
For Endeavour Energy the key difference to the overall process previously outlined in Section 3 is that there is no requirement for a connection enquiry. Endeavour Energy uses the form 'Application for Connection of a Generator' as their only method of instigation of a connection. With this application the following data is required:

- Project size
- Proposed power source
- Proposed generation type, ie. market or non-market (embedded generators less than 5MW are eligible for exemption from registration, but if you wish to settle generation on-market you must register as a Market Generator)
- Single Line Diagram with protection systems shown
- Voltage for connection, ie. high or low voltage connection

It is likely that during the further discussions more information will be required and this will be requested by Endeavour Energy on an 'as required' basis.

There are five main items that are of interest to Endeavour Energy's connection group.

These are:

- Metering system to be used
- Planning for capacity into the future
- Quality of supply for the system as a whole
- Protection of the system
- Safety of the customers and the personnel working on the system

Endeavour Energy has had issues in the past with organisations wanting to be connected at high voltage. Any connection at high voltage will involve extra requirements, so it should be considered whether this is justified.

Fees and timelines
Endeavour Energy do not charge fees for the connection process. However they are very strict on the amount of analysis that they will complete. They do not see themselves being able to provide consultancy services to proponents. They will work through the process with you but any design works or in depth technical studies will need to be completed by an accredited service provider as noted above.

The process of connecting a generator to the Endeavour Energy network can take between 1-12 months. This is dependent on the availability of information and the location of the connection.

6.2.3 Essential Energy

Table 15 - Essential Energy contact details

Website	www.essentialenergy.com.au/content/small-scale-generation-connecting-to-the-grid
Position to contact	Manager Network Connections
Email	networkconnections@essentialenergy.com.au
Phone	13 23 91
Useful Forms	The Grid Connect Process & Grid Connect Application www.essentialenergy.com.au/asset/cms/pdf/ssg_connection_form.pdf
Useful Documents	Connection Guidelines: For High Voltage Customers and Embedded Generators, July 2011 www.essentialenergy.com.au/asset/cms/pdf/contestableWorks/CEOP8079.pdf
Modelling of effects of generator on system	Proponent to complete studies, Essential Energy will review the results

Process differences
Essential Energy follow the process outlined above in section 3. They are particularly keen to ensure that new projects are discussed with them early so that they can outline their requirements and expectations up front. The connections guideline on their website is a very good resource and should be referred to before making contact with Essential Energy.

One of the things to be aware of with Essential Energy is that they will only deal with one applicant for a project. This can be someone acting on behalf of the developer but needs to be a constant throughout the process.

Essential Energy requires proponents to keep them informed after the initial discussions and enquiry or they may remove the project from their forward projects listing. This is to ensure that all projects included in their forward projects list are progressing.

Fees and timelines
Essential Energy requires all connections to enter into a 'Connection Investigation Services Agreement' (CISA) with them. This covers the requirements and costs of the works that Essential Energy will complete for the connection. The costs associated with the works that Essential Energy completes are usually in the vicinity of $20–30,000 and these works are completed on a schedule of rates basis. Overall costs can be reviewed for smaller projects.

Although Essential Energy will discuss the connection process and their requirements with proponents before the signing of a CISA, the detailed technical information required for completion of the technical studies will not be released until a CISA is agreed.

Timing for projects tends to be dependent on the ability of proponents to respond to the requirements of Essential Energy in a timely manner. To improve the timing of your project it is important that you fully understand the requirements of Essential Energy and have the right technical resource working with you to achieve their requirements.

6.3 Australian Capital Territory

ActewAGL is the only DNSP for the ACT. The codes and rules that apply in the ACT are summarised in Table 16.

Table 16 - Specific jurisdictional area codes and service installation rules for the ACT

State/ Territory	DNSP	Local Codes/Rules
ACT	ActewAGL	ACT Service and Installation Rules Code www.icrc.act.gov.au/legislation/utility_technical_codes ActewAGL Service and Installation Rules

6.3.1 ActewAGL

Table 17 - ActewAGL Contact Details

Website	www.actewagl.com.au
Position to contact	Connections Manager
Email	networkservicing@actewagl.com.au
Phone	Connections Manager: 02 6293 5749
	Technical enquiries: 02 6428 3555
Useful Forms	None outside those included in the documents shown below
Useful Documents	Large-scale photovoltaic installations – process for photovoltaic installations greater than 200kW connected via inverters to the ActewAGL high voltage and sub-transmission network www.actewagl.com.au/about-us/~/media/ActewAGL/ActewAGL-Files/Products-and-services/Building-and-renovation/For-professionals/CCA0212-48%20guidelines-NoContacts.ashx Renewable Energy Generator Connection Contract www.actewagl.com.au/~/media/ActewAGL/ActewAGL-Files/Products-and-services/Green-energy/Renewable_Energy_Generator_Connection_contract.ashx Guidelines for photovoltaic installations up to 200kW connected via inverters to the ActewAGL network www.actewagl.com.au/about-us/~/media/ActewAGL/ActewAGL-Files/Products-and-services/Building-and-renovation/For-professionals/guidelines-for-grid-connected-pv-installations.ashx
Modelling of effects of generator on system	Proponent to complete studies, ActewAGL will review the results

Process differences

ActewAGL are in the process of reviewing and harmonising their connections procedures. From our discussions with ActewAGL we understand that they will have one connection document for connections less than 1.5MVA connected to their LV (415V) system and one for connection of larger generators to their HV system. ActewAGL have a set of four prime directives for all connections; safety, minimising asset loss, minimising disruption to customers and ensuring a sustainable future for the network, that drive all decisions on connection applications. These will be outlined in their new documentation.

It is anticipated from the discussion with ActewAGL that the process will be similar to that outlined in the 'Large Scale photovoltaic installations' process document outlined in Table 17 above but is anticipated to provide one process with specific technology items outlined as required. The key differences to the process outlined in Section 3.0 of this document are:

- There is no need for a connection application, the requirements of this are covered in the process however the documentation requirements are covered in the connection enquiry form.
- ActewAGL will provide the proponent with a preliminary offer to connect once the network studies have been completed that the proponent will need to accept for works to commence.
- There is a number of requirements to contact the local ACT government and ensure that they are notified of the project.

From a technical perspective the ActewAGL network has some specific issues due to the type of earthing system that is used in the network.

Fees and timelines

There is a connection enquiry fee, a connection application fee and a design fee required for connection with ActewAGL. The current connection enquiry fee is set at $500 plus GST while other fees will be dependent on the location of the generator and the amount of effort required by ActewAGL to complete a connection at that location.

6.4 Victoria

Victoria has the largest number of DNSPs in Australia, which leads to a range of different processes. Each DNSP in Victoria is privately owned with the Government owning no electricity assets in the state.

One of the key documents for Victoria is the Essential Services Commission's Guideline 15 which outlines the expectations the ESC has for DNSPs with respect to Embedded Generation.

Table 18 - Specific jurisdictional area codes and service installation rules for VIC

State/ Territory	DNSP	Local Codes/Rules
VIC	CitiPower Powercor Jemena SP AusNet United Energy	Victorian Electricity Distribution Code www.esc.vic.gov.au/Energy/Distribution/Electricity-Distribution-code/Electricity-Distribution-Code-May-2012 Guideline 15 – Connection of embedded generation (2004) www.esc.vic.gov.au/Energy/Distribution/Guideline-15-Conection-of-embedded-generation-2004 Victorian Service Installation and Rules www.victoriansir.org.au/

6.4.1 Jemena

Table 19 - Jemena contact details

Website	jemena.com.au/what-we-do/assets/jemena-electricity-network/embedded-generation.aspx
Position to contact	Network Business Manager
Email	new.connections@jemena.com.au
Phone	03 8873 7416
Useful Forms	
Useful Documents	Jemena Customer Connection Guide (JEN GU 0705) jemena.com.au/Assets/What-We-Do/Assets/Jemena-Electricity-Network/Information/Customer%20Connection%20Guide.pdf This document is in the process of being replaced with a new connection guide.
Modelling of effects of generator on system	Proponent to complete studies, Jemena will review the results

Process Differences
The Jemena process follows the general process outlined previously. The soon to be released Jemena connections guide is a great resource for the connection of new generation to the network.

Jemena uses the minimum requirements in Schedule 5.2.5 of the NER as its minimum technical requirements for connection.

Fees and Timelines
The fees that Jemena require as part of the connection process are dependent on the size and location of the project. The expected fees will be outlined to the project proponent as part of Jemena's response to a connection enquiry.

It is anticipated by Jemena that once all the information has been supplied to Jemena as part of the connection application and the fees have been paid the maximum response time will be 65 days. To speed up the process we recommend ensuring that all details are provided to Jemena as early as possible.

6.4.2 SPAusNet

Table 20 - SPAusNet contact details

Web Site	www.sp-ausnet.com.au/
Position to contact	Network and Distributed Energy Lead
Email	public.relations@sp-ausnet.com.au
Phone	General Business: +61 3 9695 6000
Useful Forms	"Pre-Approval Application for Solar PV Systems" currently exists, working on a similar one for Embedded generators
Modelling of effects of generator on system	Proponent to complete studies, SPAusNet will review the results

Process differences
Although the process for SPAusNet generally follows the outline above it is not currently well documented. SPAusNet see the connection process in two steps:

1. **Initial enquiry** – The supply of basic information as per a connection enquiry (they provide a standard way in which they ask for it to be supplied).
2. **Connection agreement** – Entered into after the required studies, technical negotiations and commercial discussions have occurred.

The level and number of studies required is dependent on the location of the connection and the personnel in the area concerned. SPAusNet does not currently have a centralised planning process and as such there is need for the involvement of a number of parties in various locations to be involved.

Fees and timelines
The type and level of fees that will be required through the connection process will depend on the size and location of the project being connected. These will be outlined in the connection enquiry response that SP AusNet provides to the proponent.

6.4.3 United Energy

Table 21 - United Energy contact details

Website	www.unitedenergy.com.au/customers/your-electricity/electricity-connections/negotiated-connections.aspx
Position to contact	Network Accounts Manager
Email	customerrelations@ue.com.au
Phone	General enquires 03 8846 9900
Useful Documents	Embedded Generation Network Access Standards (UE ST 2008) This document can be provided by United Energy
Modelling of effects of generator on system	Proponent to complete stability studies if these are required, other studies can be completed by either United Energy or an external party

Process differences
The United Energy process follows the general process outlined previously. The United Energy connections guide is a great resource for the connection of new generation to the network. It is important that you have read this guide before approaching United Energy with a connection enquiry, but they are happy to talk to people before the formal connection enquiry and provide them with this document. UE's main concern during the connection process is around ensuring the safety of the network. There is a major focus on the requirements for protection design to ensure that the network is kept safe.

Fees and timelines
The fees that United Energy requires as part of the connection process are dependent on the size and location of the project. The expected fees will be outlined to the project proponent as part of United Energy's response to a connection enquiry. The timing of the process within United Energy is very dependent on the time taken to supply all the data to them.

6.4.4 Citipower and Powercor

Table 22 - Citipower and Powercor contact details

Website	**Citipower** www.powercor.com.au/Electricity_Networks/CitiPower_Network/Connections/CitiPower_-_Connecting_Generators/ **Website for Powercor** www.powercor.com.au/Electricity_Networks/Powercor_Network/Connections/Powercor_-_Connecting_Generators/
Position to contact	Customer Development Manager
Email	info@citipower.com info@powercor.com
Phone	Citipower: 1300 301 101 Powercor: 13 22 06
Useful Forms	Appendix A: Embedded Generation Preliminary information details for assessment www.powercor.com.au/docs/pdf/Electricity%20Networks/Powercor%20Network/Appendix%20A%20Embedded%20Generation%20Prelim%20Meeting%20Info%20form%20Final.pdf
Useful Documents	Customer Guidelines for Sub-transmission Connected Embedded Generation, July 2010 www.powercor.com.au/docs/pdf/Electricity%20Networks/Powercor%20Network/Customer%20Guidelines%20for%20Sub%20Transmission%20Connected%20Embedded%20Generation%20no.pdf Customer Guidelines for Low Voltage Connected Embedded Generation, September 2012 www.powercor.com.au/docs/pdf/Electricity%20Networks/Powercor%20Network/Customer%20GL%20for%20LV%20Connected%20EG%20080812%20FINAL%20for%20online.pdf
Modelling of effects of generator on system	For these smaller projects Powercor/Citipower will usually complete the modelling of the connection. It is possible for the proponent to complete these studies however it may be more cost effective for Powercor/Citipower to complete them.

Process differences
Powercor and CitiPower are currently conducting a comprehensive review of their connections process. However, this is not expected to change any of the external process in any major way, being largely concerned with streamlining and improving their internal processes. They are aiming to include their new process on their website as soon as possible. The new documentation provides a good reference for connection to the Powercor and CitiPower system. They are in the process of completing a reference document for LV connections, HV (11kV or 22kV) connections and sub-transmission (66kV) connections.

Powercor and CitiPower see the overall process in two main steps:

1. Connection enquiry – Proponents provide them with the details of the project and they complete an initial technical feasibility assessment for the connection. Their documentation provides a good breakdown of the level of information required at this stage. It is possible that they may request a connection feasibility study to be completed at this stage for larger projects, this is usually only required for larger projects.

2. Connection review – This occurs after an official connection application has been made to them with all the relevant data supplied. They will not commence this stage until they have all the data required. In this stage the scope of works will be developed for the connection along with the technical requirements.

Powercor and CitiPower have two standard agreements for connecting embedded generation to their network.

1. Synchronising and paralleling agreement – This agreement outlines the connection requirements for an embedded generator that does not export into the network.

2. Exporting deed – This agreement outlines the requirements for connection when the project will be exporting to the network.

These two documents have very different sets of requirements due to the extra risk to the network when an embedded generator provides export power.

Fees and timelines
Powercor and CitiPower complete the Connection Enquiry Stage outlined above at no charge and their response on this stage will outline the fees moving forward. The fees required will depend on the size of the generator and the location of that generating plant.

The timelines for connection of generation are very dependent on the information available for the connection studies and the responsiveness of the proponent for the generating plant. An easy connection with all the data available could take only a couple of months while a complex connection where a lot of data needs to be continually asked for could take up to two years.

6.5 South Australia

SA Power Networks is the only DNSP for South Australia. The relevant codes and rules for South Australia are listed in Table 23.

Table 23 - Specific jurisdictional area codes and service installation rules for SA

State/ Territory	DNSP	Local Codes/Rules
SA	SA Power Networks	South Australian Electricity Distribution Code www.escosa.sa.gov.au/electricity-overview/codes-guidelines-rules/electricity-codes.aspx SA Power Networks Service and Installation Rules www.sapowernetworks.com.au/centric/industry/contractors_and_designers/service_and_installation_rules.jsp Licence Conditions for Wind Generators – Final Decision Electricity Generation Licence – Model Licence Conditions www.escosa.sa.gov.au/projects/15/2010-wind-generation-licensing.aspx

6.5.1 SA Power Networks (formally ETSA Utilities)

Table 24 – SA Power Networks contact details

Website	www.sapowernetworks.com.au/centric/industry/contractors_and_designers/embedded_generation.jsp
Position to contact	Manager Connection Services
Email	seg@sapowernetworks.com.au
Phone	08 8404 5614
Useful Forms	Application for SEG Approval Reference Number https://forms.apps.sapowernetworks.com.au/forms/formpv.aspx
Useful Documents	Large Embedded Generation Network Connection – Customer Guide, September 2012 www.sapowernetworks.com.au/public/download.jsp?id=598
Modelling of effects of generator on system	SA Power Networks complete the required network studies

Process differences
The SA Power Networks process follows the general process outlined previously. The SA Power Networks connections guide is a good resource for the connection of new generation to their network. They encourage people to talk to them before the formal connection enquiry and show a 'preliminary proposal discussion' in their connections flow chart.

From our review of the documentation SA Power Networks has a priority around ensuring the safety of the network with a major focus within the documentation on the requirements for protection design and generator operations to ensure that the network is kept safe.

Fees and timelines
SA Power Networks have three main forms of fee for the connection process. These are:

- Application to connect fee – This covers SA Power Networks for the all reasonable costs involved with the assessment of your application.
- Connection Charge – This is a 'once off' fee to cover the scope of works to build the assets required for the connection of the generator to the network
- Connection Service and Management Fee – This is an annual fee that covers SA Power Networks for the reasonable costs associate with the ongoing management of the connections assets built for the project.

These fees are project by project specific and will be developed in conjunction with SA Power Networks.

6.6 Tasmania

Aurora is the only DNSP for Tasmania. The relevant codes and rules applying to connections in Tasmania are listed in Table 25. There is a program in Tasmania to bring Aurora and Transend (the TNSP) together as a single network company in the state. At the time of writing the two organisations were still separate. One of the differences in the Tasmanian Network is that the majority of the substations are owned and operated by Transend with Aurora owning the lines and a limited number of substations.

Table 25 - Specific jurisdictional area codes and service installation rules for TAS

State/ Territory	DNSP	Local Codes/Rules
TAS	Aurora	Tasmanian Electricity Code (Chapter 8) Electricity Supply Industry Act www.thelaw.tas.gov.au/tocview/index.w3p;cond=;doc_id=58%2B%2B1995%2BAT%40EN%2B20120903000000;histon=;prompt=;rec=;term= Aurora's Service and Installation Rules for connection to the Electricity Distribution Network in Tasmania www.auroraenergy.com.au/electricity-network/electrical-contractors/service-installation-rules-manual/

6.6.1 Aurora

Table 26 - Aurora contact details

Website	www.auroraenergy.com.au/electricity-network/your-supply/connect-embedded-generators/
Position to contact	Connections Manager
Email	Network.Connections@auroraenergy.com.au
Phone	03 6270 3704
Useful Forms	Aurora Energy have an application form which will be provided to you after an initial discussion with them.
Useful Documents	Guideline for the Connection of Embedded Generators to the Aurora Distribution Network, July 2012.
Modelling of effects of generator on system	Proponent to complete studies, Aurora will review the results

Process Differences
Aurora Energy (Aurora) is one of the few DNSP's at the time of writing that are compliant with the requirements of NECF and Chapter 5A of the NER. The requirements of the process are well documented in the Guideline outlined in Table 26 above; it also includes a process flow chart of the Aurora process.

In general the process is similar to that outline in this document however there are a couple of key differences as follows:

- There is no formal enquiry process. Aurora requests that proponents discuss the proposal with them early but the first formal process is the application process. This is completed through the standard Aurora connection application form.
- Once the application form has been received by Aurora they will respond with their initial review of the application and any extra information that they require to finalise the connection. This will include technical information requirements, other parties that need to be involved, any issues that Aurora may be aware of with your connection, network study requirements and preliminary project timelines.
- Once you have responded to the initial response from Aurora and provided all the information requested Aurora has 65 days to provide you with an offer to connect.
- Once you have received the offer to connect you only have 20 days to respond to their offer. If you do not respond in this time it will be deemed that you have declined the offer and the application process will be closed.
- If a proponent intends to be a market generator they will be processed through the standard NER Chapter 5 process.
- For any generator great than 500kW there will be a requirement for you to develop a set of operating protocols for your generator in conjunction with Aurora. This will include both commissioning requirements as well as ongoing maintenance and operational requirements.

Fees and timelines
As part of the initial response from Aurora to your application they will provide both fee requirements and expected timelines. The required fees will be split into two types of fees: the application fee (usually a few thousand dollars) to cover the effort required by Aurora to process your application, and the costs required to complete network upgrades that are associated with the addition of your generator to the network.

6.7 Western Australia

The utility in Western Australia where the majority of connections will occur is controlled and managed by Western Power; their process is discussed further below. Horizon Energy stand-alone systems are not included in detail within this guide however if required their contact details are provided in Table 29.

The relevant codes and rules applying to connections in Western Australia are listed in Table 27.

Table 27 - Specific jurisdictional area codes and service installation rules for WA

State/ Territory	DNSP	Local Codes/Rules
WA	Western Power Horizon	Electricity Networks Access Code 2004 Electricity Networks Access Code 2004 www.finance.wa.gov.au/cms/uploadedFiles/Public_Utilities_Office/Energy_Initiatives/Current_Electricity_Networks_Access_Code_2004.pdf Electricity Industry (Network Quality and Reliability of Supply) Code 2005 www.erawa.com.au/cproot/2372/2/D04%20Electricity%20Industry%20(Network%20Quality%20and%20Reliability%20of%20Supply)%20Code%202005.pdf Western Australian Distribution Connections Manual (WADCM) www.westernpower.com.au/ldd/guidelinesmanuals.html

6.7.1 Western Power

Table 28 - Western Power contact details

Website	www.westernpower.com.au/transmissionconnections
Position to contact	Access Solutions Manager
Email	enquiry@westernpower.com.au
Phone	13 10 87
Useful Forms	Generator connection application form – 33kV or below www.westernpower.com.au/documents/retailersgenerators/generators/accessApplicationFormDG.xls Electronic Ticketing (ETIC) www.westernpower.com.au/electricalcontractors/ETIC.html Notification of inverter energy system connection details www.westernpower.com.au/documents/ssres/WE_n8867209_v1_ETIC_-_NOTIFICATION_OF_INVERTER_ENERGY_SYSTEM.pdf
Useful Documents	Western Australian Distribution Connections Manual 2012 www.westernpower.com.au/documents/WA_Distribution_Connections_Manual.pdf Generator Grid Connection Guide V2 – An Introduction to Power Systems and the Connection Process www.westernpower.com.au/documents/reportspublications/generator_grid_connection_guide.pdf User guide for the connection of generators of up to 10 MW to the Western Power SWIN distribution system www.westernpower.com.au/documents/aboutus/accessarrangement/2007/Technical%20Rules/User%20guide.pdf Connection of generators and transmission voltage loads www.westernpower.com.au/documents/infoPacks/ConnectionGenerators.pdf
Modelling of effects of generator on system	Studies are usually completed by Western Power or their contractor. They will do due diligent on the proponents' studies if required.

Process differences
Although historically Western Power's connection process has been quite different to that outlined previously, they are in the process of major change in the connections area. This change will see the process requirements become quite similar to those in the eastern states. Different terminology for the steps in the process may be employed, but in general the process will be similar.

One of the key differences for Western Power is that it controls both the transmission and the distribution systems (while DNSPs in the NEM only operate the distribution network). The review of their systems has been completed for transmission system connections. The changes for smaller distribution connected generation are expected to be rolled out over the coming months.

Network access is allocated differently in Western Power's network, compared with the eastern states. When you apply you will enter into a queue for network access, with those first in the queue having first rights to the network capacity that is available. If insufficient network capacity remains you will be charged for any network upgrades required for your connection. There are circumstances where you may lose your position in the queue. These will usually involve applications where you are not able to move forward with your application due to other approvals or you have not kept Western Power up to date with you project and it has become dormant on their system. In all cases there is a stringent set of rules outlining how a project may lose a position in the queue and you will be asked to show cause as to why your project shouldn't be removed from the queue.

The technical requirements are quite different for Western Power when compared to the NEM. They are described in Western Power's Technical Rules. In order to navigate these technical requirements it is important you have the support of an appropriately qualified and experienced organisation. Western Power will provide the required data for the technical assessment to an experienced party after entering into a confidentiality agreement with that party.

Fees and timelines
At the time of writing the basic connection fee for an embedded generator was $2,500. This covers all the initial works that Western Power would complete including basic studies.

The standard connection timelines within the Western Power documentation shows that it is estimated at 32 to 52 weeks duration. During the current review process they are aiming to reduce this overall duration. It should be noted that the time taken will depend on the level of information that the proponent is able to supply Western Power.

6.7.2 Horizon Power

Table 29 – Horizon Power contact details

Website	www.horizonpower.com.au/renewable_energy_technical_requirements.html
Position to contact	Product Delivery Manager
Email	products@horizonpower.com.au renewable_installers@horizonpower.com.au
Phone	08 6310 1000
Useful Forms	Renewable Energy Electricity System Connection Application www.horizonpower.com.au/documents/RENEWABLE_ENERGY_SYSTEM_APPLICATION3504058.PDF Renewable Energy System – Electricity System Connection Application Form, August 2012 www.horizonpower.com.au/documents/Renewable_Energy_Buyback_Application_Form_from_July_1_20123547413.PDF
Useful Documents	Western Australian Distribution Connections Manual 2012 www.westernpower.com.au/documents/WA_Distribution_Connections_Manual.pdf Technical Requirements for Renewable Energy Systems Connected to the Low Voltage (LV) Network via Inverters, July 2012 www.horizonpower.com.au/documents/TECHNICAL_REQUIREMENTS_FOR_RENEWABLE_ENERGY_SYSTEMS___LOW_VOLTAGE_NETWORK3548309.PDF
Modelling of effects of generator on system	The requirements for modelling are dependent on the specific project

Appendix A
Contact details

Contact details

Table 30 provides a quick reference to the contact details of relevant parties involved in the connection process. Details of individuals may change over time, so the relevant titles at each organisation have been provided.

Table 30 - Contact details quick reference

State / Territory	Relevant party	Contact details
Distribution Network Service Providers – Connections		
QLD	**Energex**	Network Commercial Manager lcc@energex.com.au Technical Advice Line: 07 3407 6318 Large Customer Connections: 07 3407 5863 26 Reddacliff Street, Newstead QLD 4006 Energex Limited, GPO Box 1461, Brisbane QLD 4001 www.energex.com.au/residential-and-business/changes-to-your-connection-necf/solar-pv-micro-embedded-generator
	Ergon Energy	Generation Connections Manager majorconnections@ergon.com.au Major Connection Manager: 07 4727 5710 Ergon Energy, PO Box 308, Rockhampton QLD 4700 www.ergon.com.au/your-business/connections/major-connections
NSW	**Ausgrid**	Grid Connection Officer Customer Connection Enquiries (NSW Central Coast): 03 4399 8000 ccsii@ausgrid.com.au Sydney and Tuggerah: ea.datanorth@ausgrid.com.au Muswellbrook: ea.datamuswellbrook@ausgrid.com.au 570 George Street, Sydney NSW 2000 GPO Box 4009, Sydney NSW 2001 www.ausgrid.com.au/Common/Our-network/Network-connections.aspx
	Endeavour Energy	Contestable Works Administration 02 9853 7977 connection.enquiries@endeavourenergy.com.au PO Box 6366, Blacktown NSW 2148 www.endeavourenergy.com.au/wps/wcm/connect/EE/NSW/NSW+Homepage/ourNetworkNav/Network+connections/
	Essential Energy	Manager Network Connections 13 23 91 networkconnections@essentialenergy.com.au PO Box 718 Queanbeyan NSW 2620 www.essentialenergy.com.au/content/small-scale-generation-connecting-to-the-grid
ACT	**ActewAGL**	Connections Manager 02 6293 5749 Technical enquiries: 02 6428 3555 networkservicing@actewagl.com.au House 40, Bunda Street, Canberra ACT 2600 GPO Box 366, Canberra ACT 2601 www.actewagl.com.au/Product-and-services/Energy-and-water-services/Green-energy/Connecting-green-energy-systems.aspx

State / Territory	Relevant party	Contact details
Distribution Network Service Providers – Connections		
VIC	**Jemena**	Network Business Manager 03 8873 7416 new.connections@jemena.com.au 321 Ferntree Gully Road, Mount Waverley VIC 3149 Locked Bag 7000, Mount Waverley VIC 3149 jemena.com.au/what-we-do/assets/jemena-electricity-network/embedded-generation.aspx
	SP AusNet	Network and Distributed Energy Lead General Business: 03 9695 6000 public.relations@sp-ausnet.com.au Level 31, 2 Southbank Boulevard, Southbank VIC 3006, Australia Locked Bag 14051, Melbourne City Mail Centre, Melbourne VIC 8001 www.sp-ausnet.com.au/
	United Energy	Network Accounts Manager General enquires: 03 8846 9900 customerrelations@ue.com.au PO Box 449, Mount Waverley, VIC 3149 www.unitedenergy.com.au/customers/your-electricity/electricity-connections/negotiated-connections.aspx
	Citipower and Powercor	1300 301 101 – Citipower 13 22 06 – Powercor info@citipower.com info@powercor.com Locked Bag 14090, Melbourne 8001 Citipower: www.powercor.com.au/Electricity_Networks/CitiPower_Network/Connections/CitiPower_-_Connecting_Generators/ Powercor: www.powercor.com.au/Electricity_Networks/Powercor_Network/Connections/Powercor_-_Connecting_Generators/
SA	**SA Power Networks**	Manager Connection Services 08 8404 5614 seg@sapowernetworks.com.au 1 Anzac Highway, Keswick South Australia 5035 GPO Box 77, Adelaide South Australia 5001 www.sapowernetworks.com.au/centric/industry/contractors_and_designers/embedded_generation.jsp
TAS	**Aurora**	Connections Manager 03 6270 3704 Network.Connections@auroraenergy.com.au GPO Box 191, Hobart TAS, 7001 www.auroraenergy.com.au/electricity-network/your-supply/connect-embedded-generators/
WA	**Western Power**	Access Solutions Manager 13 10 87 enquiry@westernpower.com.au 363 Wellington Street, Perth, WA, 6000 GPO Box L921, Perth, WA 6842 www.westernpower.com.au/transmissionconnections
	Horizon Power	Product Delivery Manager 08 6310 1000 products@horizonpower.com.au renewable_installers@horizonpower.com.au Stovehill Road, Karratha, Western Australia 6714 PO Box 817 Karratha WA 6714 www.horizonpower.com.au/renewable_energy_technical_requirements.html

Registration		
QLD, NSW, ACT, VIC, SA, TAS	**AEMO**	Australian Energy Market Operator (AEMO) Registration Desk Direct: 03 9609 8588 registration.desk@aemo.com.au Level 22, 530 Collins Street, Melbourne VIC 3000 GPO Box 2008, Melbourne VIC 3001
WA (SWIS)	**IMO WA**	Independent Market Operator of Western Australia (IMO WA) Market Operations Direct: 08 9254 4336 operations@imowa.com.au Level 17 Governor Stirling Tower, 197 St Georges Tce, Perth WA 6000 PO Box 7096, Cloisters Square, Perth WA 6850
Licensing		
QLD	**QLD Govt**	Department of Energy and Water Supply, Queensland Government Energy Sector Monitoring: 07 3898 0694 PO Box 15456, City East, Qld, 4002
NSW	**IPART**	Independent Pricing and Regulatory Tribunal (IPART) Program Manager, Energy Compliance 02 9113 7732 Level 2, 44 Market Street, Sydney NSW 2000 PO Box Q290, QVB Post Office NSW 1230
ACT	**ACT ICRC**	ACT Independent Competition and Regulatory Commission 02 6205 0799 icrc@act.gov.au Level 8, 221 London Circuit, Canberra ACT 2601 PO Box 161, Civic Square ACT 2608
VIC	**ESC**	Essential Services Commission (ESC) - Victoria's Independent Economic Regulator of Essential Services Regulator of Essential Services: 03 9651 0222 Level 2, 35 Spring Street, Melbourne Victoria 3000
SA	**ESCOSA**	Essential Services Commission of South Australia (ESCOSA) Manager, Legal and Licensing: 08 8463 4444 licensing@escosa.sa.gov.au GPO Box 2605, Adelaide SA 5000
TAS	**OTTER**	Office of the Tasmanian Economic Regulator (OTTER) 03 6233 6204 office@economicregulator.tas.gov.au Level 5, 111 Macquarie Street, Hobart GPO Box 770, Hobart TAS 7001
WA	**ERA**	Economic Regulation Authority (ERA) Executive Director – Licensing, Monitoring and Customer Protection: 08 6557 7900 Level 4, 469 Wellington Street, Perth WA 6000 Applications for licence exemption should be made to The Office of Energy: 08 9420 5600 Level 9, Governor Stirling Tower, 197 St Georges Tce, Perth WA 6000
Other		
AECOM		Mark Lampard, Associate Director - Connection Services Direct: 03 9653 8497 Mobile: 0419 877 993 Mark.Lampard@aecom.com Level 9, 8 Exhibition Street, Melbourne, VIC 3000
		or
		Colin Watson, Associate Director – Connection Services Direct: 07 3553 3408 Mobile: 0403 976 134 Colin.Watson1@aecom.com Level 8, 540 Wickham St, Fortitude Valley, QLD, 4006
Clean Energy Council		Tom Butler, Network Specialist Level 15, 222 Exhibition Street, Melbourne VIC 3000 Ph: 03 9929 4100 General enquiries: info@cleanenergycouncil.org.au