

# Embedded Generation Connection Guideline

NT NER Chapter 5/5A Information Pack



VERSION 1

D2020/316844



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# 1. Purpose

The purpose of this document is to provide a practical guide to assist proponents wishing to connect a generating system to Power and Water Corporation's (Power and Water) distribution electricity network. It is intended to provide proponents with the information they will need when planning a connection of a generating system to our network.

Chapters 5 and 5A of the NT National Electricity Rules (NT NER) outline the connection processes for connecting to Power and Water's electricity network, and detail a multistage process which provides for timeframes, actions and information exchanges between parties.

In some cases, this guideline references detailed requirements within other Power and Water documents. This guide also references requirements within the NT NER. A copy of the current rules is available from the Australian Energy Market Commission (AEMC) [website](#).

This guideline also satisfies NT NER requirements under Clauses 5.3A.3(b) and 5A.D.1 for Power and Water as the Distribution Network Service Provider (DNSP) to publish information to assist proponents wishing to connection embedded generation.

# 2. Scope

Embedded generation is a generating unit embedded within the distribution network, rather than the transmission network. An 'embedded generation system' comprises of one or more embedded generation units. Embedded generation systems are generally located at residential or commercial premises and are typically installed to generate electricity for that home or business's own use.

The type of connections for generators are classified as follows:

Type	Characteristics	Typical Application	NT NER Requirements	Document Section Number
<b>Basic embedded generation system</b>	Less than 10kVA single-phase, or 30kVA three-phase, connected directly to the Power and Water <u>distribution network</u> .	Residential or small commercial rooftop solar PV or batteries.	Chapter 5A NT NER	Section 4
<b>Negotiated embedded generation system</b>	Greater than 10kVA single-phase, or 30kVA three-phase and less than 200kVA in Darwin (100kVA in all other regions), connected to the Power and Water <u>distribution network</u> .	Medium and large commercial customers.	Chapter 5A NT NER	Section 5
	Greater than 200kVA (100kVA in other regions) and less than 2MW, connected to the Power and Water <u>distribution network</u> .			Section 6
<b>Large embedded generation</b>	Greater than 2MW, connected to the Power and Water	Large commercial customers.	Chapter 5.3A NT NER	Section 7



Type	Characteristics	Typical Application	NT NER Requirements	Document Section Number
system	<u>distribution network</u> .			
<b>Transmission connected generation system</b>	Generating system connected directly or indirectly (i.e. behind the meter) to the Power and Water <u>transmission network</u> .	Large commercial customers.	Chapter 5.3 NT NER	This document does not currently cover transmission connected generation systems

This document has been developed to provide a practical guide for generators seeking to connect to the Power and Water distribution network.

### 3. Technical Requirements and Reference Documents

Proponents wishing to connect an embedded generation system to Power and Water's distribution network are to comply with the technical requirements in the Network Technical Code and Planning Criteria.

There are a number of additional supporting documents that contain technical requirements which are of relevance to generators wishing to connect to our network. These documents include:

- System Control Technical Code
- Secure System Guidelines
- Relevant Australian Standards (as outlined in Appendix 5)
- Power and Water PV and BES class requirements
- Technical Requirements for Grid Connection of Photovoltaic Systems via Inverters
- NT NER

All documents listed above are to be considered prior to establishing a connection to Power and Water's distribution network.

Power and Water has a requirement to produce the Transmission and Distribution Annual Planning Report (TDAPR) on an annual basis. The TDAPR outlines the results of the annual planning review and presents the most recent annual load forecasts, network constraints, network performance as well as the plans and committed investments.

- Transmission and Distribution Annual Planning Report 2019

Additional information, guidelines (this document), technical standards, enquiry form and other supporting documentation in regards to our connection services is available on our Power connections webpage.



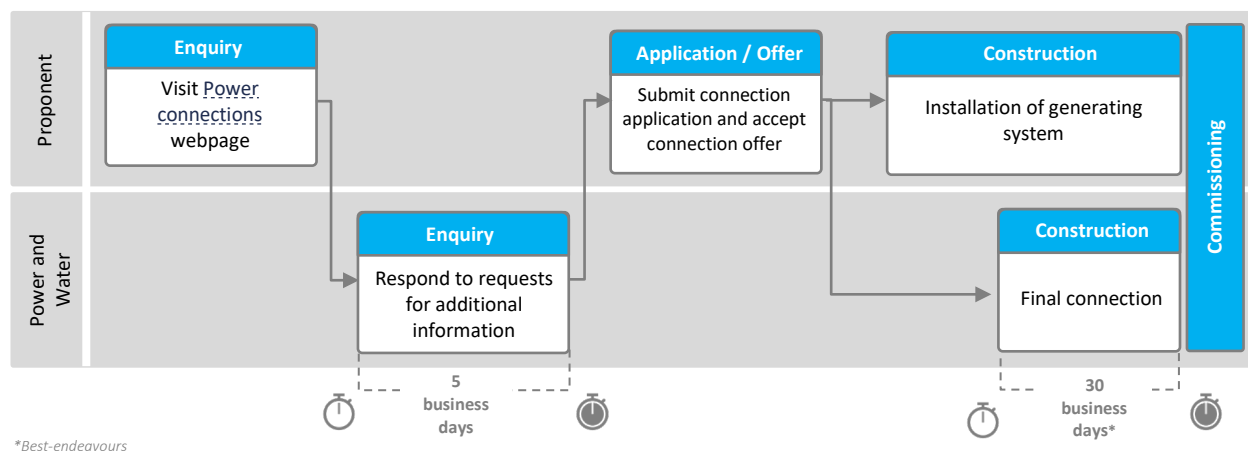
## 4. Basic Embedded Generation Systems (Less than 10kVA single-phase or 30kVA three-phase)

Basic embedded connections are small generating systems with an inverter rating equal to or less than 10kVA single-phase, or 30kVA three-phase (Class 1 and 2 systems). A connection for a micro-embedded generation system is considered as a basic connection service.

### 4.1. Process

The following diagram outlines the indicative process for micro-embedded generation systems.

FIGURE 1. CONNECTIONS PROCESS FOR MICRO-EMBEDDED GENERATION SYSTEMS



### 4.2. Enquiry

For general information relating to micro-embedded generation connections, please refer to the [Power connections](#) webpage. If you require additional information than what is found on the website, please contact us by calling our Customer Service Centre on 1800 245 092, or by email: [connect.me@powerwater.com.au](mailto:connect.me@powerwater.com.au).

### 4.3. Application to Connect

To submit an application for a micro-embedded generation connection, download the [Basic connections application form](#) and submit to us via [connect.me@powerwater.com.au](mailto:connect.me@powerwater.com.au).

### 4.4. Expedited Applications

It will be automatically assumed that you want an expedited connection unless you indicate otherwise. This means that you accept the [model standing offer](#) as published on our website, and do not need to go through the formal offer and acceptance process. We encourage our customers to choose an expedited connection service as it is the quickest way to get your micro-embedded generation system connected to our network. However, if you do not want to enter into an expedited connection application, please contact Customer Service. Alternatively, you can submit a [Negotiated connections application form](#) so we can work together to negotiate your connection needs.

Once we have received your application, we will assess your requirements and be in touch should any additional information be required.

### 4.5. Assessment

There are a number of factors that are considered in assessing your application, such as size of your system, where it connects to our network, and the location within the Northern Territory. If during our assessment of the application we deem there is risk to our network security, safety or reliability, we



maintain the right to offer a negotiated agreement instead to preserve the network and ensure your connection arrangement is suitable.

A copy of the current [connection agreements](#) and [supply agreement](#) is available on our [Power connections webpage](#).

#### **4.6. Clean Energy Council Accreditation**

We require that installers of all embedded generation systems hold current NT electricity licences, as well as current design and install accreditation with the [Clean Energy Council](#). Accredited installers must only install [CEC approved electrical equipment](#).

#### **4.7. Construction and Commissioning**

Once your micro-embedded generation system has been installed, you or your electrical contractor will need to provide us with a copy of the [Certificate of Compliance](#) (CoC) and [commissioning sheet](#) to confirm your system is compliant with the technical and operating conditions specified in your application and connection contract. Once we have received these documents, we will complete the final connection (including upgrade or replacement to the metering at the premises) and any inspections or testing required to ensure your connection is safe.

#### **4.8. Energisation**

Before your connection is energised you need to ensure you have necessary arrangements in place for the sale and purchase of electricity. Please contact your authorised electricity retailer.

A list of electricity retailers can be found on our [website](#).



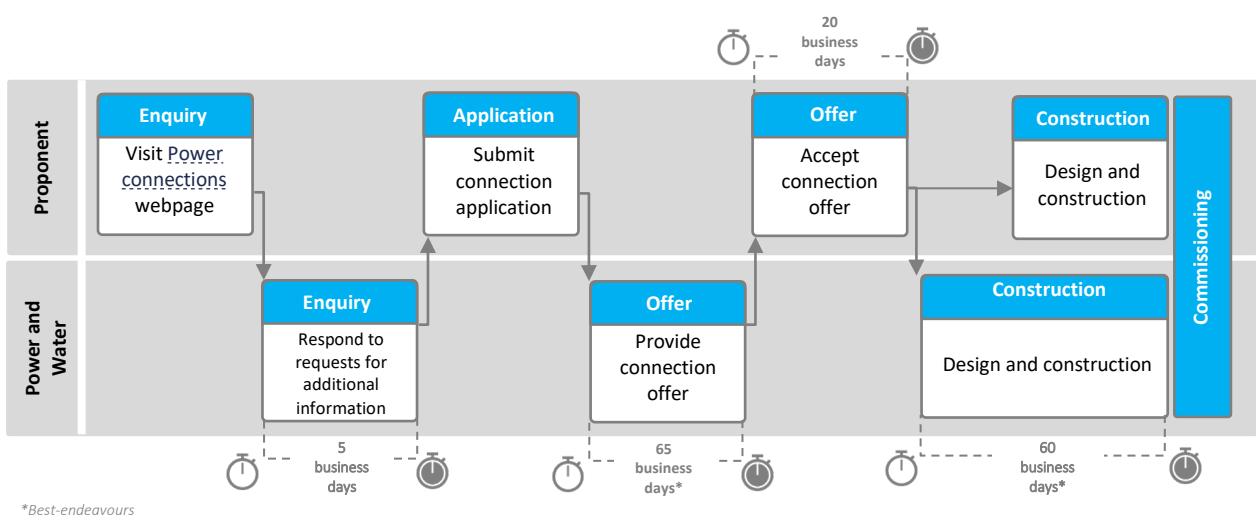
## 5. Negotiated Embedded Generation Systems (Greater than 10kVA Single-Phase, 30kVA Three-Phase and less than 200kVA in Darwin (100kVA all other regions))

The information below provides an overview of the steps involved in connecting an embedded generation system greater than 10kVA single-phase, or 30kVA three-phase to less than 200kVA in Darwin, and 100kVA in all other regions (Class 3) to the Power and Water distribution network.

### 5.1. Process

The following diagram outlines the indicative process for embedded generation systems greater than 10kVA single-phase, 30kVA three-phase, and less than 200kVA in Darwin, and 100kVA in all other regions. An overview of the connection process is also outlined in Appendix 1.

**FIGURE 2.** CONNECTIONS PROCESS FOR EMBEDDED GENERATION SYSTEMS GREATER THAN 10KVA SINGLE-PHASE, 30KVA THREE-PHASE AND LESS THAN 200KVA IN DARWIN (100KVA ALL OTHER REGIONS)



### 5.2. Enquiry

For general information relating to embedded generation connections, please refer to the [Power connections](#) website. If you require additional information than what is found on the website, please contact us by calling our Customer Service Centre on 1800 245 092, or by email: [connect.me@powerwater.com.au](mailto:connect.me@powerwater.com.au).

### 5.3. Application to Connect

Complete the [Negotiated connections application form](#) and submit to Power and Water along with the following information:

- System design information including single line diagrams and protection system details; and
- Payment of the application fee or related charges.

We will review the application and contact you within 20 business days if we require additional information to progress your application.

### 5.4. Assessment

When assessing the proposed connection of your embedded generation system, factors we consider include but are not limited to:





- The type and nature of the embedded generation system (e.g. inverter energy system or rotating machine such as a diesel generator), and whether the embedded generation system will export to our distribution network or will operate in a non-export configuration.
- The location and available capacity of the nearby infrastructure capable of facilitating the connection at the requested voltage and export levels.
- Compliance with the relevant Power and Water technical requirements.
- The impact of the proposed operation, both short term and into the future, of the embedded generation system on our distribution network (and nearby customers).
- Any augmentation to the network that may be required to facilitate the connection of the embedded generation system and the ownership model under which any construction will occur, including the classification of contestable services provided and their costs.
- The ability to obtain necessary approvals (easements etc.).
- The ability to connect in the requested timeframes.
- Any legal or financial considerations of the proponent that issue any securities under the agreements executed with Power and Water.

## 5.5. Connection Offer

Once your application is approved, payment is received and all information has been provided, we will provide you with a Connection Offer within 65 business days, best endeavours.

The Connection Offer will include, but not limited to:

- Fees or charges for the requested connection works.
- Any commercial information and terms associated with the connections works.
- Technical requirements relating to your connection arrangement.
- Details of any network augmentation or extensions that may need to be undertaken.
- A guideline for construction times.

Further information and a sample of the model terms and conditions can be found on the [Power connections](#) webpage.

Our Connection Offer will remain valid for 20 business days from the date of issue.

To accept the Connection Offer, you will need to send back a signed copy of the contract and pay any additional identified fees or charges. If you do not provide the signed contracts within the relevant period, our Connection Offer will lapse, and you may be required to recommence the process and submit a new application form.

## 5.6. Clean Energy Council Accreditation

We require that installers of all embedded generation systems hold current NT electricity licences, as well as current design and install accreditation with the [Clean Energy Council](#). Accredited installers must only install [CEC approved electrical equipment](#).

## 5.7. Construction and Commissioning

Once your embedded generation system has been installed, you or your electrical contractor will need to provide us with a copy of the [Certificate of Compliance](#) (CoC) and [commissioning sheet](#), and other documentation as identified in the Connection Offer to confirm your system is compliant with the technical and operating conditions specified in your application and connection agreement.

We will complete the final connection of your installation (including upgrade or replacement to the metering at the premises) and any inspections or testing required once we have received these documents to ensure your connection is safe.



## 5.8. Energisation

Before your connection is energised you need to ensure you have necessary arrangements in place for the sale and purchase of electricity. Please contact your authorised electricity retailer.

A list of electricity retailers can be found on our [website](#).



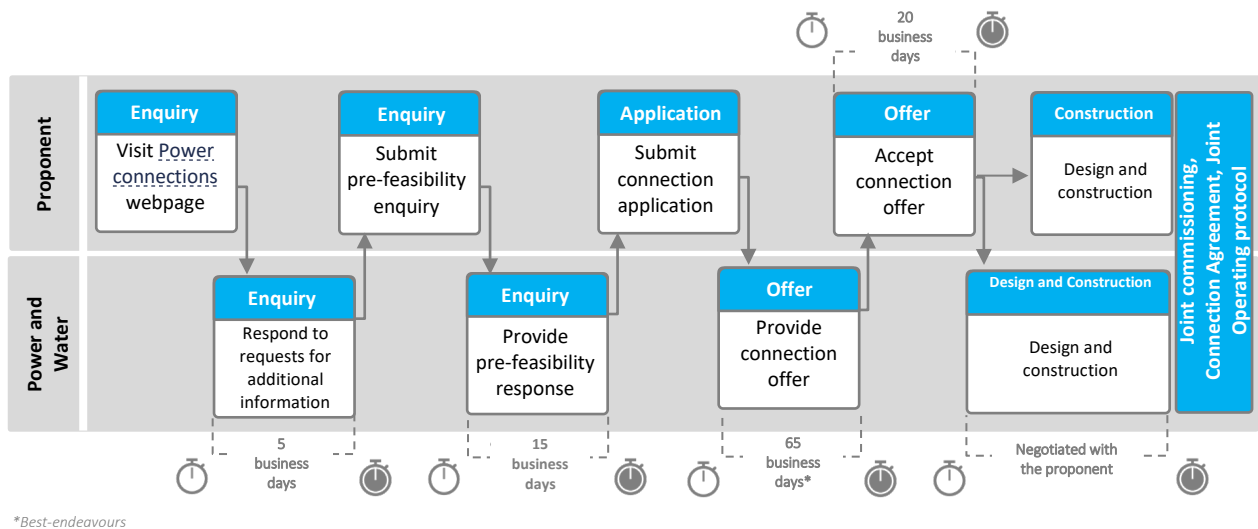
## 6. Negotiated Embedded Generation Systems (Greater than 200kVA in Darwin (100kVA all other regions))

The below information provides an overview of the steps involved in connecting an embedded generation system greater than 200kVA in Darwin, 100kVA in all other regions, and less than 2MW (Class 4) to the Power and Water distribution network.

### 6.1. Process

The following diagram outlines the indicative process for embedded generation systems greater than 200kVA in Darwin, 100kVA in all other regions and less than 2MW. A high-level summary of the connection process is also outlined in Appendix 2.

**FIGURE 3. CONNECTIONS PROCESS FOR EMBEDDED GENERATION SYSTEMS GREATER 200KVA IN DARWIN (100KVA ALL OTHER REGIONS) AND LESS THAN 2MW (ALL REGIONS)**



### 6.2. Enquiry

For general information relating to embedded generation connections, please refer to the [Power connections](#) website. If you require additional information than what is found on the website, please contact us by calling our Customer Service Centre on 1800 245 092, or by email: [connect.me@powerwater.com.au](mailto:connect.me@powerwater.com.au).

### 6.3. Pre-Feasibility Enquiry

The Pre-Feasibility enquiry stage is required for proponents to be provided with an initial feedback on the proposed connection arrangement to the distribution network. Although this is not mandatory under the NT NER, we do encourage proponents to submit a request to mitigate any potential issues and set reasonable expectations prior to submitting a connection application. There is no service fee for preparing the Pre-Feasibility response.

To commence the enquiry, you will be required to submit the [Large Connection Enquiry](#) form.

Upon receipt of the completed enquiry form, we will assess the requirements provided to determine whether any changes or augmentation to the distribution network are required to allow the connection of the proposed generating system. We will advise the proponent whether we require additional information to complete the assessment.

In our Pre-Feasibility response, we will provide the proponent with the following:

- High-level assessment of any network augmentation works together with the extension and/or connection works that may be required;



- An indicative estimate of the fees and charges to undertake the connection works, including the application fee;
- A high-level assessment of the impact of the proposed connection on the network including technical requirements;
- General comments in relation to the proposed connection;
- Any assumptions made by Power and Water in relation to the proposed connection; and
- The next steps in the process.

Following the pre-feasibility response, the proponent may continue with an application to connect.

#### **6.4. Application to Connect**

Complete the [Negotiated connections application form](#) and submit to Power and Water along with the following information:

- System design information including single line diagrams and protection system details;
- Other information required to be provided as identified in our Pre-Feasibility response; and
- Payment of the application fee or related charges.

We will review the application and contact you within 20 business days to advise if we require additional information.

If, at any stage you decide not to proceed, you must notify us as soon as possible, as you will be charged for the work that has been completed up until the time you notify us to stop the process.

#### **6.5. Assessment**

When assessing the proposed connection of your embedded generation system, factors we consider (at both the enquiry and application stage) include but are not limited to:

- The type and nature of the embedded generation system (e.g. inverter energy system or rotating machine such as a diesel generator), and whether the embedded generation system will export to our distribution network, or will operate in a non-export configuration.
- The location and available capacity of the nearest power system infrastructure capable of facilitating the connection at the requested voltage levels and export levels.
- Compliance with the relevant Power and Water technical requirements.
- Compliance with Power and Water's System Strength Impact Assessment Guidelines.
- The impact of the proposed operation, both short term and into the future, of the embedded generation system on our distribution network (and nearby customers).
- Any augmentation to the network that may be required to facilitate the connection of the embedded generation system, and the ownership model under which any construction will occur, including the classification of services provided and their costs.
- The ability to obtain necessary approvals (easements etc.).
- The ability to connect in the requested timeframes.
- Any legal or financial considerations of the proponent that issue any securities under the agreements executed with Power and Water.

#### **6.6. Connection Offer**

Once your application is approved, payment is received and all information has been provided, we will provide you with a connection offer within 65 business days, best endeavours.

The connection offer will include, but not limited to:

- Fees or charges for the requested connection works.
- Any commercial information and terms associated with the works.
- Technical requirements relating to your connection arrangement.



- Details of any network augmentation or extensions that may need to be undertaken.
- A guideline for construction times.

Further information and a sample of the model terms and conditions can be found on the [Power connections](#) webpage.

Our connection offer will remain valid for 20 business days from the date of issue.

To accept the connection offer, you will need to send back a signed copy of the contract and pay any identified fees or charges. If you do not provide the signed contracts within the relevant period, our connection offer will lapse and you could be required to recommence the process and submit a new application.

## 6.7. Clean Energy Council Accreditation

Power and Water requires that installers of all embedded generation systems hold current NT electricity licences, as well as current design and install accreditation with the [Clean Energy Council](#). Accredited installers must only install [CEC approved electrical equipment](#).

## 6.8. Construction and Commissioning

Before connecting your embedded generation system to our distribution network, we are required to inspect and test any relevant part of the embedded generation system that may have a direct effect on our distribution network.

Once your embedded generation system has been installed, you or your electrical contractor will need to provide us with a copy of the [Certificate of Compliance](#) (CoC) and [commissioning sheet](#), and other documentation as identified in the Connection Offer to confirm your system is compliant with the technical and operating conditions specified in your application and connection agreement.

We will complete the final connection of your installation (including upgrade or replacement to the metering at the premises) and any inspection or testing as required once we have received these documents to ensure your connection is safe.

## 6.9. Energisation

Before your connection is energised you need to ensure you have necessary arrangements in place for the sale and purchase of electricity. Please contact your authorised electricity retailer.

A list of electricity retailers can be found on our [website](#).



## 7. Large Embedded Generation Systems

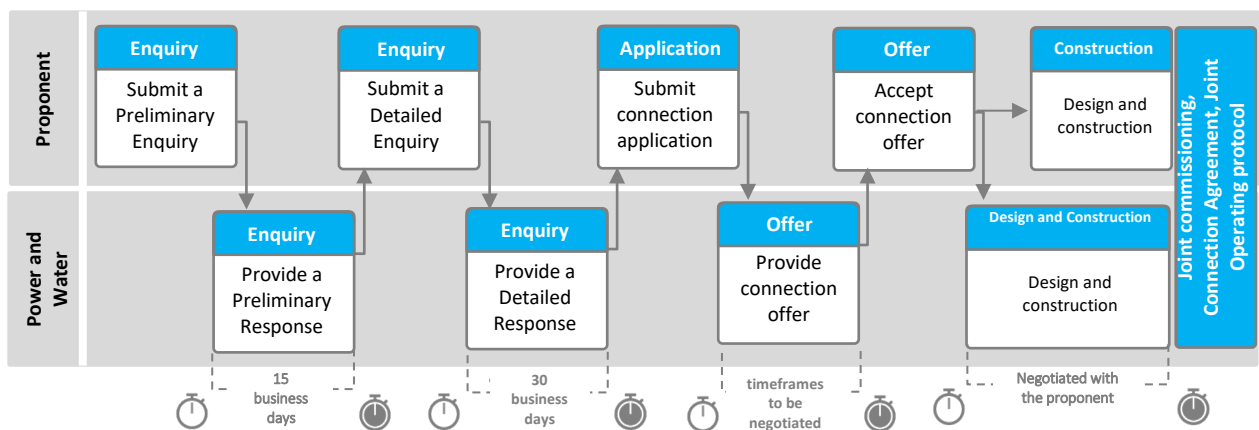
The information below is an overview of the steps involved in connecting an embedded generation system greater than 2MW, or an embedded generation system less than 2MW which has elected under rule 5A.A.2(c) of the NT NER to use Rule 5.3A process, to connect to the Power and Water distribution network.

Rule 5.3A under Chapter 5 of the NT NER sets out the connection process for the connection of such embedded generation systems and details a multistage process which provides for timeframes, actions and information exchanges between parties. This process is designed to assist you by providing a more flexible approach to the proposed connection of your embedded generation system, while providing agreed timeframes, thereby supporting the relationship between you and Power and Water.

### 7.1. Process

The following diagram outlines the indicative timeline and process for embedded generation systems greater than 2MW connected to our distribution network. A high-level summary of the connection process is also outlined in Appendix 3.

FIGURE 4. CONNECTIONS PROCESS FOR LARGE EMBEDDED GENERATION SYSTEMS



### 7.2. Enquiry

#### 7.2.1. Preliminary Enquiry

The Preliminary Response outlines a high-level assessment of the technical options for connection to our distribution network.

To begin the enquiry process for an embedded generation system greater than 2MW, you will need to download the [Large Connection Enquiry Form](#)<sup>1</sup> and email the completed form to [NetworkDevelopmentandPlanning.PWC@powerwater.com.au](mailto:NetworkDevelopmentandPlanning.PWC@powerwater.com.au). We will assess your enquiry to confirm it is complete and send an acknowledgment receipt within 5 business days.

We will provide you with a Preliminary Response within 15 business days (or otherwise agreed) which will include:

- All items listed in Schedule 5.4A of the NT NER, Any additional information reasonably required by you to progress to a Detailed Response.

There are no fees associated with the preparation of a Preliminary Response.

#### 7.2.2. Detailed Enquiry

The Detailed Response focuses on the requested connection arrangement and outlines the automatic access standards for your embedded generation system.

<sup>1</sup> Consistent with the information required under Schedule 5.4 of the NT NER.



Following the Preliminary Response, you may request a Detailed Response by submitting the information requested in the Preliminary Response to your Connections Project Officer and paying the required detailed response fee.

We will provide a Detailed Response consistent with the information set out in Schedule 5.4B of NT NER within 30 business days, or unless otherwise agreed. Our response may require undertaking technical simulation and analysis. A proponent may have the option to undertake some of these studies themselves.

Estimates provided in the Detailed Response for works associated with your proposed project represent our best estimate of the charges and are based on current information available at the time the report is compiled. As such, the figures provided are estimates only.

If the proposed project proceeds through the process and a difference between the estimated costs and the actual costs arise, we will contact you with any amendments to the costings prior to reconciliation of the invoice.

Worked examples of connection charges are provided in Appendix 4 (Connection costs and charges). These are based on the example connection diagrams and may differ in complexity from your proposed project. As such, they are indicative only.

### **7.3. Application to Connect**

After receiving our Detailed Response, you may wish to proceed to submit an application for a connection to our distribution network. You will need to lodge the application form to your Connections Project Officer and pay the application fee as outlined in the Detailed Response.

As these expenses commence from the time you lodge your application to connect, if, at any stage you decide not to proceed, you must notify us as soon as possible, as you will be charged for the work that has been completed up until the time you notify us to stop the process.

#### **7.3.1. Automatic Access Standards**

The Preliminary and Detailed Responses will provide a high-level assessment of the automatic access standards to be met in relation to each technical requirement. These automatic access standards are set at a level that ensures system security, safety and quality of supply of other customers are not adversely impacted, and must be approved by the System Controller.

Your connection offer will be based on these automatic access standards, and we will provide final approval with the formal Connection Offer.

As per Rule 5.3A.3(b)(5), information relating to Access Standards can be found in the [Network Technical Code and Planning Criteria \(NTC\)](#).

### **7.4. Assessment**

When assessing the proposed connection of your embedded generation system, factors we consider (at both the Connection Enquiry and Application to Connect stage) include but are not limited to:

- The type and nature of the embedded generation system (e.g. inverter energy system or rotating machine such as a diesel generator), and whether the embedded generation system will export to our distribution network, or will operate in a non-export configuration.
- The location and available capacity of the nearest power system infrastructure capable of facilitating the connection at the requested voltage levels and export levels.
- Compliance with the relevant Power and Water technical requirements.
- Compliance with Power and Water's System Strength Impact Assessment Guidelines.
- The impact of the proposed operation, both short term and into the future, of the embedded generation system on our distribution network (and nearby customers).



- Any augmentation that may be required to facilitate the connection of the embedded generation system, and the ownership model under which any construction will occur, including the classification of services provided and their costs.
- The ability to obtain necessary approvals (easements etc.).
- The ability to connect in the requested timeframes.
- The legal and financial considerations of the proponent and / or any entity that proposes to issue any securities under the contracts executed with Power and Water.

## 7.5. Connection Offer

Once we have received connection application and it has been approved, we will provide you with a connection offer. The connection offer will include the required agreements in a form capable of execution to facilitate the works and the ongoing connection.

We will provide you with an indicative timeframe of when you will expect to receive the connection offer. Your Connections Project Officer will maintain contact with you throughout the process and provide you with a draft copy of the applicable Connection Agreement/s to allow time to negotiate as required.

The connection offer will include but not be limited to the following components:

- An outline of charges and rates for the requested works (see construction and network tariffs below).
- Any commercial information and terms associated with the works.
- Technical requirements and specifications relating to your connection arrangement
- Details of any network augmentation or extensions that may need to be undertaken.
- A guideline for construction times.

When we have prepared your connection offer, it will be provided to you for review and acceptance.

Further information, and a sample of the model terms and conditions, can be found on the [Power connections](#) webpage.

## 7.6. Clean Energy Council Accreditation

Power and Water requires that installers of all embedded generation systems hold current NT electricity licences, as well as current design and install accreditation with the [Clean Energy Council](#). Accredited installers must only install [CEC approved electrical equipment](#).

## 7.7. Construction and Commissioning

Before connecting your embedded generation system to our distribution network, we are required to inspect and test any relevant part of the embedded generation system that may have a direct effect on our distribution network.

## 7.8. Energisation

Before your connection is energised you need to ensure you have necessary arrangements in place for the sale and purchase of electricity. Please contact your authorised electricity retailer.

A list of electricity retailers can be found on our [website](#).





## 8. Contestable Services

When applying for a connection service other than a Basic connection service, Power and Water can provide all services relating to your connection from application to commissioning. However, subject to agreement with Power and Water, you may choose to engage an accredited supplier to undertake the design and/or construction work downstream of the connection to Power and Water's existing network, where it can be constructed safely in isolation of Power and Water's existing network. This may include extensions and reticulation within property developments. In the absence of an alternative provider, or as requested by the applicant, Power and Water will undertake these works.

A service is considered contestable if it can be provided by another supplier on a competitive basis, however not all elements of the Power and Water's connection services are contestable. Some examples of the non-contestable elements of Power and Water's connection services may include but are not limited to:

- preparation and issue of design specifications,
- review and approval of design undertaken by the connection applicant,
- audit of construction where the connection applicant undertakes the construction works,
- conduct of physical inter-connections to Power and Waters' existing network,
- commissioning and testing of the constructed connection assets to Power and Waters' existing network, and
- integrating the newly created connection assets including any extensions and augmentation into Power and Waters' asset management systems.

Please note that services provided in Power and Water's Basic connection services are non-contestable.

For more information, refer to our Connections Policy, or contact one of our team members via email at [connect.me@powerwater.com.au](mailto:connect.me@powerwater.com.au).



## 9. Role of System Controller and Market Operator

### 9.1. Multiple roles of Power and Water

Power and Water undertakes two distinct roles during the connections process. The first primary role is Power and Water in the capacity as the Network Service Provider (NSP) for the connection application and offer process as set out in the above sections of this document.

The second role is Power and Water as the System Controller and Market Operator with the responsibilities for operating the Northern Territory's regulated power systems and market arrangements. In this capacity, the role includes:

- Performing the System Controller functions to oversee the safe, secure, reliable and efficient operation of the power system, and
- Performing the Market Operator functions to oversee the management of the wholesale trading arrangements between generators and retailers in the Interim Northern Territory Electricity Market (I-NTEM). This includes market registrations, market settlements, and publication of market prices and other wholesale trading data. Power and Water manages this exchange as the Market Operator based on the System Control Technical Code, Electricity Retail Supply Code and the National Electricity Rules as in force in the Northern Territory (NT NER).

The System Controller and Market Operator will need to be informed and involved throughout various steps of the process, your Connections Project officer will support and facilitate these interactions.

### 9.2. Timing considerations

Depending on the nature of your connection, market registration and the establishment of operating arrangements with the System Controller and Market Operator may be required, which could impact onsite commissioning and compliance testing. Section 9.3 outlines the circumstances where a generator may be subject to these requirements.

### 9.3. Operating arrangements

Proponents who do not require a generation license<sup>2</sup> must agree on the operating arrangements with the NSP and the System Controller. The NSP may provide these operating arrangements in the Connection Agreement or require the proponent to agree to an operating protocol with the System Controller.

Proponents who are required to obtain a generation license will be subject to the provisions under the System Control Technical Code. The generator would be required to:

- Agree to an operating protocol with the System Controller and Market Operator.
- Register with the Market Operator if operating in the Darwin-Katherine interconnected system
  - Currently, registration with the Market Operator requires that the proponent has appropriate commercial agreements with retailers and other generators. Further details on Market Registration is provided in section 9.4.
- Enter into appropriate commercial agreements with retailers and/or other generators to comply with the load following arrangements if operating in the Alice Springs or Tennant Creek system. For further information, please refer to the System Control Technical Code.
- Provide load and supply or capacity forecasting information to the System Controller.
- Respond to any direction from the System Controller.
- Comply with all relevant provisions of the System Control Technical Code.

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<sup>2</sup> Refer to Northern Territory Utilities Commission webpage for further information on licencing requirements <https://utilicom.nt.gov.au/electricity/licences>



#### 9.4. I-NTEM Market Participation and Registration

Proponents with a generating system wishing to trade in the I-NTEM need to register with the Market Operator in order to become a Market Participant. Those entities intending to participate in the I-NTEM should complete the [Market Participant Registration Application](#) and submit it to the Market Operator to initiate the registration process.



## 10. Definitions

Definitions in italics are consistent with the definitions under the NT National Electricity Rules

Term	Definition
Basic micro embedded generation connection	<i>A connection between a distribution network and a retail customer's premises for a micro embedded generating unit, for which a model standing offer is in place</i>
Distribution network	<i>A network which is not a transmission network.</i>
Distribution system	<p><i>Means:</i></p> <p><i>(a) a distribution network, together with the connection assets associated with the distribution network, which is connected to another transmission or distribution system within the other participating jurisdictions; or</i></p> <p><i>(b) a distribution network that forms part or all of a local electricity system, together with the connection assets associated with the distribution network.</i></p> <p><i>Connection assets on their own do not constitute a distribution system.</i></p>
Embedded generation unit	<i>A generating unit connected within a distribution network and not having direct access to a transmission network</i>
Generating system	<i>All embedded generation units and the associated control and protection equipment that is located on the proponent's side of the connection point</i>
Generating unit	<i>The actual generator of electricity and all related equipment essential to its function as a single entity</i>
Generation	<i>The production of electrical power by converting another form of energy in a generating unit</i>
Generator	<i>A person who owns, operates or controls a generating unit</i>
High voltage	Any voltage greater than 1kV
Low voltage	Any voltage equal to or less than 1kV. Most commonly used in any given network by domestic and light industrial and commercial consumers (typically 230/400V)
Market Operator	A role fulfilled by the System Controller under the System Control Technical Code for the Interim-Northern Territory Electricity Market.
Micro-embedded generating unit	<i>An embedded generating unit of the kind contemplated by Australian Standard AS 4777 (Grid connection of energy systems via inverters) less than 10kW single-phase, 30kW three-phase</i>
Model standing offer	<i>A document approved by the AER as a model standing offer to</i>



Term	Definition
	<i>provide a basic micro EG connection or standard connection which contains (amongst other things) the safety and technical requirements to be complied with by the proponent</i>
Nameplate capacity	The maximum continuous output or consumption in MW and MVA of an item of equipment as specified by the manufacturer, or as subsequently modified.
Negotiated connection	<i>A connection of an embedded generating unit which is not a basic micro EG connection for which technical requirements are negotiated between the DNSP and the proponent</i>
NTESMO	<p><i>Being the Northern Territory Electricity System Market Operator</i></p> <p><i>As the case requires:</i></p> <p><i>(a) the entity that undertakes the performance of the functions set out in the NT NER that relate to monitoring or controlling the operation of the power system in respect of one or more of the local electricity systems; or</i></p> <p><i>(b) the entity that undertakes the performance of the functions set out in the NT NER that relate to operating or administering a market in respect of one or more of the local electricity systems.</i></p>
NT NER	National Electricity Rules as in force in the Northern Territory
Other regions	For the purpose of this document refers to power systems in Alice Springs, Katherine and Tennant Creek
Proponent	Person applying for access to the Power and Water electricity network. Materials referenced may also refer to this role as the Connection Applicant.
PV	Photo-voltaic. The generation of electrical power by converting solar radiation into direct current electricity.
Retailer	The holder holds a license authorising that person to sell electricity in any of the Australian state or territory jurisdictions.
SCADA	Supervisory Control and Data Acquisition. A technology enabling remote control and real-time monitoring of network devices
System Controller	The entity licenced by the Utilities Commission pursuant to section 30 of the Electricity Reform Act (NT)
TDAPR	Transmission and Distribution Annual Planning Report
Transmission network	<p><i>Any of the following:</i></p> <p><i>(a) a network in this jurisdiction operating at nominal voltages</i></p>



Term	Definition
	<p><i>of 66kV and above;</i></p> <p><i>(b) a network or part of a network prescribed by local instrument to be a transmission network or part of a transmission network,</i></p> <p><i>but does not include a network or part of a network prescribed by local instrument not to be a transmission network or part of a transmission network.</i></p>
Transmission system	<p><i>A transmission network, together with the connection assets associated with the transmission network, which is connected to another transmission or distribution system.</i></p>



# 11. Change Management and Continuous Improvement

## 11.1. Review

The requirements of this specification are mandatory and shall be reviewed and updated periodically for its ongoing effectiveness. This management standard will be reviewed, at a minimum, every three years or in the event of any significant change in our vision, values, long term goals, risk appetite, policy statement business model or organisational structure, or related systems or processes.

## 11.2. Internal References and Related Documents

Refer to Appendix 5

## 11.3. External References, Legislative and Regulatory Obligations

Refer to Appendix 5

## 11.4. Document History

Date of Issue	Version	Prepared By	Description of Changes
09/07/2020	V1.0	Power Services Engineer	Approved for publishing



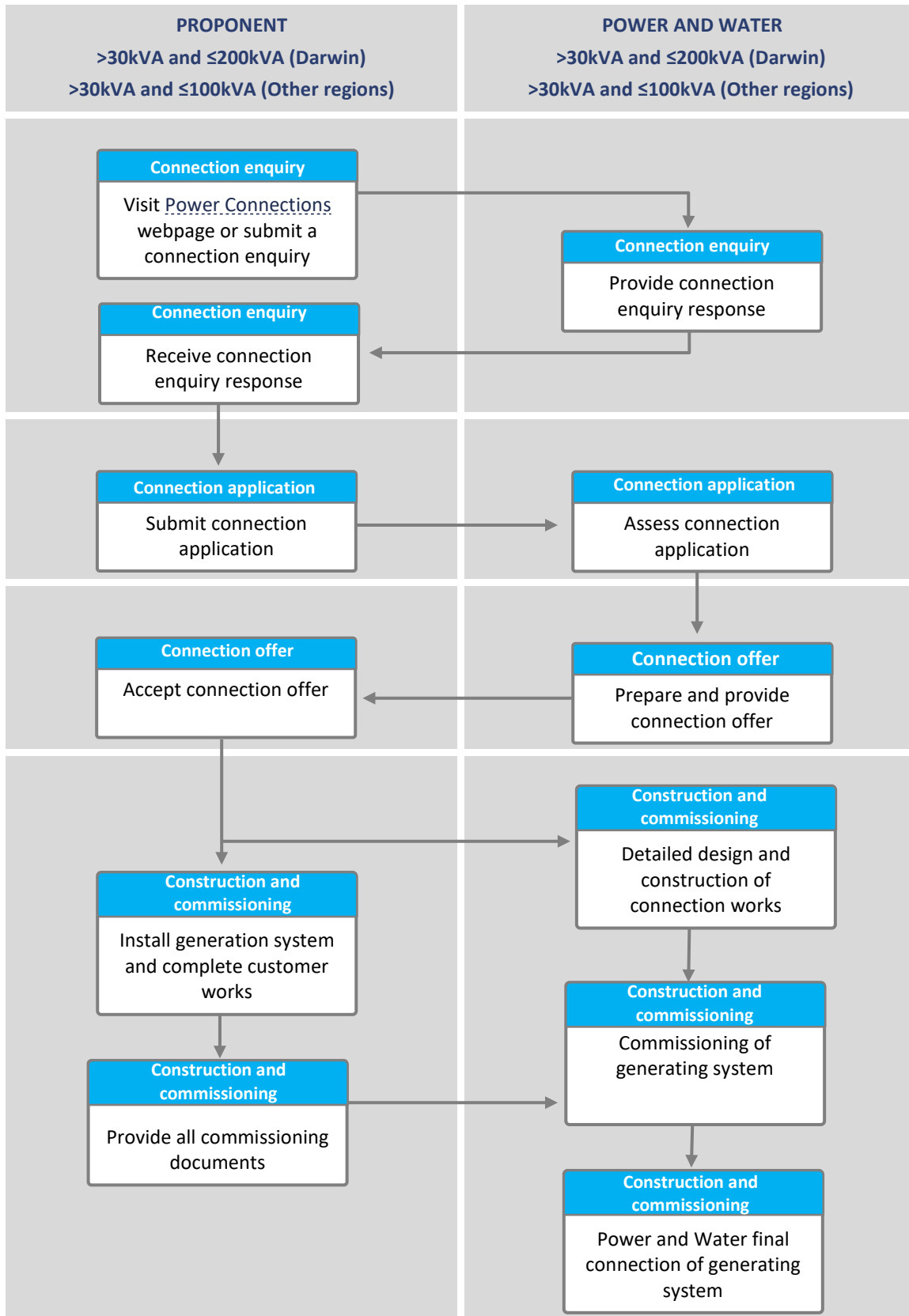
## 12. Appendices

- Appendix 1 – Negotiated Embedded Generation System greater than 10kVA Single-Phase, 30kVA Three-Phase and less than 200kVA in Darwin (100kVA all other regions) Process Flow Chart
- Appendix 2 – Negotiated Embedded Generation System Greater Than 200kVA in Darwin, (100 kVA in all other regions) and Less Than 2MW Process Flow Chart
- Appendix 3 – Large Embedded Generation Systems greater than 2MW Process Flow Chart
- Appendix 4 - Connection Fees and Charges
- Appendix 5 - Northern Territory Legislation, Procedures and Standards
- Appendix 6 - NT NER Clause references



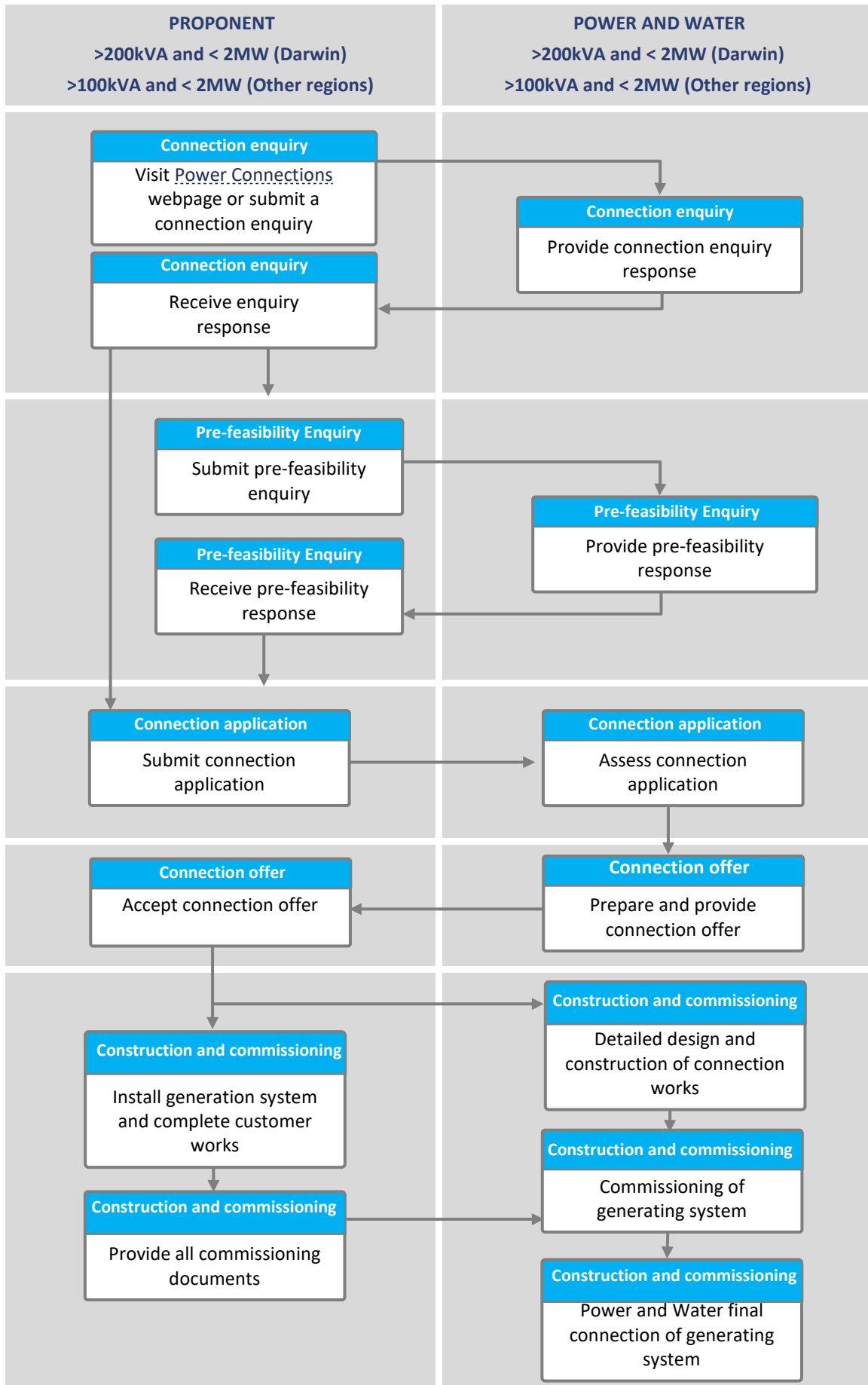


# Appendix 1 – Negotiated Embedded Generation System greater than 10kVA Single-Phase, 30kVA Three-Phase and less than 200kVA in Darwin (100kVA all other regions) Process Flow Chart



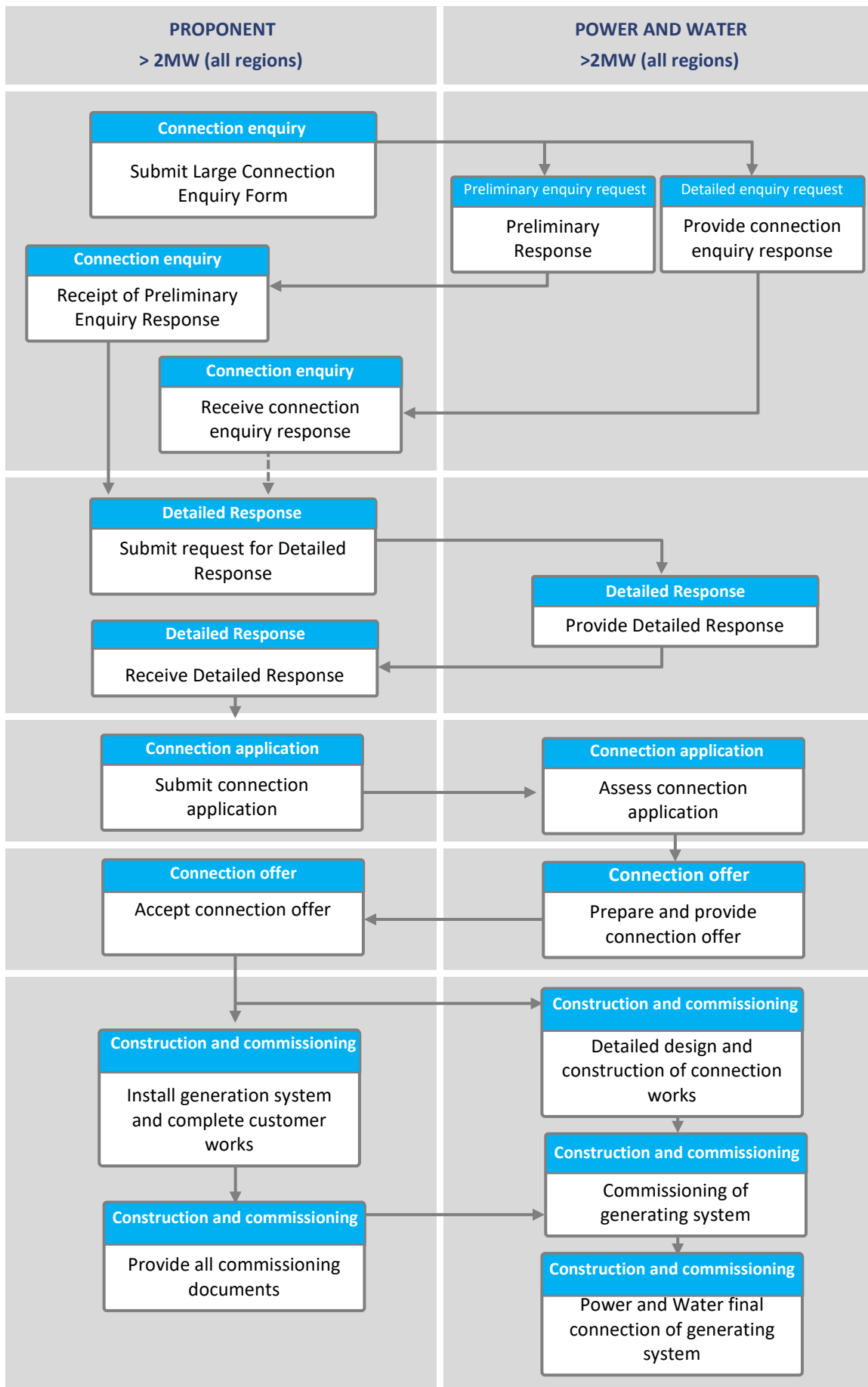


## Appendix 2 – Negotiated Embedded Generation System Greater Than 200kVA in Darwin, (100 kVA in all other regions) and Less Than 2MW Process Flow Chart





# Appendix 3 – Large Generation System greater than 2MW Process Flow Chart





## Appendix 4 – Connection Fees and Charges

### A4.1 Australian Energy Regulator (AER) Pricing Information

The Australian Energy Regulator sets the maximum amount of revenue Power and Water can recover from the provision of standard control services over a five-year regulatory period. It also sets the prices or quoting approach for alternative control services.

#### A4.1.1 Standard Control Services

Power and Water is responsible for delivering energy from the power generators to customers' homes and businesses in the Northern Territory. Our Standard Control Service (SCS) tariffs, approved by the AER recover the costs of building, maintaining and operating the network.

#### A4.1.2 Alternative Control Services

Alternative Control Services (ACS) are services provided to specific customers or retailers at their request. Fee based services are services which are provided based on a set schedule of charges. Quoted services are services provided where the nature and scope of the work cannot be known in advance, and the cost of quoted services will vary on the time taken and any other costs incurred to complete the task. For more information please refer to our [ACS Fee based network pricelist 2020-21](#).

### A4.2 Indicative Charges and Timeframes

Your proposed project may require several services to enable us to determine the impact of the embedded generation system connection on the safety, security and reliability of our distribution network prior to submitting an application.

As each connection arrangement can differ significantly, you must understand that your connection costs and timeframes will be determined in line with your connection request and the applicable arrangements. However, worked examples of connection costs and timeframes associated with the connection of embedded generation systems, based on preferred and possible connection arrangements, are noted below.

LARGE EMBEDDED GENERATION INDICATIVE CHARGES AND TIMEFRAMES			
FOR RELEVANT GENERATION CAPACITY RANGE			
	>30KVA AND ≤100KVA (OTHER REGIONS)	≥100KVA AND ≤2MW (OTHER REGIONS)	≥2MW (ALL REGIONS)
	>30KVA AND ≤200KVA (DARWIN)	≥200KVA AND ≤2MW (DARWIN)	
Connection Enquiry Response	No charge		
	Within 5 business days		N/A
Pre-Feasibility Response	N/A	No charge	N/A
		Within 15 business days	
Preliminary Response	N/A		No charge
			Within 15 business days
Detailed Response	N/A		\$15,000



LARGE EMBEDDED GENERATION INDICATIVE CHARGES AND TIMEFRAMES				
FOR RELEVANT GENERATION CAPACITY RANGE				
		>30KVA AND ≤100KVA (OTHER REGIONS)	≥100KVA AND ≤2MW (OTHER REGIONS)	≥2MW (ALL REGIONS)
		>30KVA AND ≤200KVA (DARWIN)	≥200KVA AND ≤2MW (DARWIN)	
				Within 30 business days
Engineering Studies	Engineering Report	N/A	\$6,000	\$250,000 to \$500,000 <sup>3</sup>
	System Controller	N/A	Within 30 business days	\$80,000 to \$100,000
Application to Connect	Connection Offer	Refer to Class 3 Assessment Fee in the <a href="#">ACS Fee based network pricelist 2020-21</a> .	\$4,000	\$30,000 to \$35,000 <sup>4</sup>
		Within 65 business days (including the Engineering Report)		Within 4 months
Design and Construction		Timeframes and costs to be advised in Connection Offer		

Please note, multiple connection sites or options may require further negotiations and variations in fees for the stages listed above. These fees are excluding GST and are reviewed annually.

#### A4.2.1 Worked examples of pre connection and connection costs

##### Example 1

A customer sought a connection of a 40kVA Photo Voltaic (PV) inverter generation system to the LV distribution system. The customer made a connection enquiry regarding the process to connect and was provided with the Negotiated Connection Application Form. The customer submitted an application to connect and paid the Class 3 Assessment Fee of \$1,216.59<sup>5</sup> and meter change fee of \$676.38<sup>5</sup>. Power and Water provided the customer with a connection offer with the connection application within 65 business days. The customer accepted the connection offer within 20 business days and proceeded to finalise their installation.

##### Example 2

A customer sought a connection of a 300kVA Photo Voltaic (PV) inverter generation system to the 11kV distribution system. The customer made a connection enquiry regarding the process to connect and was provided with the Large Connection Enquiry form available on [Power and Water's website](#). Power

<sup>3</sup> This includes costs associated with engaging third-party engineering consultant(s) to undertaking modelling and other works.

<sup>4</sup> Indicative only based on the complexity of the connection arrangement.

<sup>5</sup> Excluding GST, in line with the [ACS Fee Based Price List 2020-21](#)

and Water provided a pre-feasibility response outlining the application fee and the steps required to progress the application. Indicative fees for the application are shown in the table above.





## Appendix 5 – Northern Territory Legislation, Procedures and Standards

The following listed documents are for additional information and other documentation may be required on a project specific basis. Please Note: It is your responsibility to ensure you have complied with all applicable, NT jurisdictional legislative regulations (under Acts), ENA/AEMC/IEC documentations, relevant AS/NZS standards, the Power and Water publications, and you have ensured their current publications, before implementing them.

### A5.1 Northern Territory Legislation

- [Electricity Reform Act 2000](#)
- [Electricity Reform \(Safety and Technical\) Regulations 2000](#)

### A5.2 Health and Safety

- [Work Health and Safety Act 2011](#)
- [Work Health and Safety Regulations 2011](#)

### A5.3 Power and Water Documents

- [Network Technical Code and Planning Criteria](#)
- [NP001.1 Design and Construction of Network Assets – General Requirements](#)
- [NP001.2 General Specification for Underground Electrical Reticulation](#)
- [NP001.3 General Specification for Overhead Electrical Reticulation](#)
- [NP001.4 General Specification for Overhead Rural Residential Subdivisions](#)
- [NP001.5 General Specification for Overhead Commercial and Industrial Subdivisions](#)
- [NP001.6 General Specification for URD Subdivisions](#)
- [NP001.7 Reliability Criteria for Distribution Networks](#)
- [NP001.8 Handover Documentation](#)
- [NP001.9 Electricity Supply to Large Customers](#)
- [NP001.10 Documentation Requirements Power and Water's Power Networks Service Rules](#)
- [NP003 Installation Rules](#)
- [NP007 Service Rules](#)
- [NP010 Meter Manual](#)
- [NP021 Easement Guidelines](#)
- [NP027 Capture of Newly Installed Street Lighting](#)
- [NP041 Guideline for Electrical Design Consultants](#)
- [Power and Water Access to Apparatus Rules](#)
- [Technical Requirements for Grid Connection of Photovoltaic Systems via Inverters](#)
- [Power and Water Standard Drawings](#)
- [System Control Technical Code](#)
- [Secure System Guidelines](#)
- [I-NTEM Procedures](#)

### A5.4 Energy Networks Association (ENA) Publications

- ENA NENS 03: National Guidelines for Safe Access to Electrical and Mechanical Apparatus
- ENA NENS 04: National Guidelines for Safe Approach Distances to Electrical and Mech. Apparatus

### A5.6 Australian Energy Market Commission (AEMC) Publications

- Northern Territory National Electricity Rules (NT NER)

### A5.7 Standards Australia Publications

- AS 1319 Safety Signs for the Occupational Environment
- AS 1359.0 Rotating Electrical Machines - General Requirements Part 0: Introduction and list of parts



- AS 1824.1 Insulation co-ordination – Definitions, principles and rules
- AS 1931.1 High voltage - Test techniques - General definition and test requirements
- AS 2067 Substations and high voltage installations exceeding 1 kV a.c.
- AS 2467 Maintenance of Electrical Switchgear
- AS 60038 Standard voltages
- AS 60068.1 Environmental testing - General and Guidance
- AS 60529 Degrees of Protection Provided by Enclosures (IP Code)
- AS/NZS 1768 Lightning protection
- AS/NZS 3000 Electrical Installations (known as the Wiring Rules)
- AS/NZS 3010 Electrical Installations - Generating sets
- AS/NZS 3017 Electrical installations - Testing User Guides
- AS/NZS 3100 Approval and test specification - General requirements for electrical equipment
- AS/NZS 3439.1 Low-voltage switchgear and control gear assemblies - Type-tested and partially type-tested assemblies
- AS/NZS 3835.1 Earth Potential Rise - Protection of Telecommunications Network Users, Personnel and Plant – Code of practice
- AS/NZS 3835.2 Earth Potential Rise - Protection of Telecommunications Network Users, Personnel and Plant – Application guide
- AS/NZS 3947.6.1 Low-voltage switchgear and control gear - Multiple Function equipment - Automatic transfer switching equipment
- AS/NZS 4777.1 Grid connection of energy systems via inverters Part 1: Installation requirements
- AS/NZS 4777.2 Grid connection of energy systems via inverters Part 2: Inverter requirements
- AS/NZS 5033 Installation and safety requirements for photovoltaic (PV) arrays
- AS/NZS 5139 Electrical Installations – Safety of battery systems for use with power conversion equipment
- AS 60034.1 Rotating electrical machines, Part 1: Rating and performance
- AS 60034.22 Rotating electrical machines, Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating sets
- AS 60044 Instrument transformers (multiple parts)
- AS/NZS IEC 60947.6-1 Low-voltage switchgear and control gear - Multiple function equipment - Automatic transfer switching equipment
- AS/NZS 61000 Electromagnetic compatibility (EMC) - General - Application and interpretation of fundamental definitions and terms

#### **AS.8 IEC Publications**

- IEC 60255-12 Electrical relays - Part 12: Directional relays and power relays with two input energizing quantities
- IEC 60255-26 Electrical relays - Part 26: Electromagnetic compatibility requirements
- IEC 60255-27 Electrical relays - Part 27: Product safety requirements
- IEC 60255-127 Measuring relays and protection equipment - Part 127: Functional requirements for over/under voltage protection
- IEC 62109 Safety of power converters for use in photovoltaic power systems
- IEC 62116 Utility-interconnected photovoltaic inverters – Test procedure of islanding prevention measures
- IEC 62786 Distributed energy resources connection with the grid

#### **AS.9 IEEE Publications**

- IEEE 1547-2018 IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems



- IEEE C37.90.1 Standard Surge Withstand Capability Tests for Relays and Relay Systems Associated with Electric Power Apparatus





## Appendix 6 – NT NER Clause references

NT NER CLAUSE	REQUIREMENT	POWER AND WATER'S DEMONSTRATION OF COMPLIANCE OBLIGATIONS
<b>5.3A.3(a)</b>	A Distribution Network Service Provider must publish the following in the same location on its website:	
<b>5.3A.3(a)(1)</b>	an enquiry form for connection of an embedded generating unit;	<a href="#">Large Connection Enquiry Form</a>
<b>5.3A.3(a)(2)</b>	a register of completed embedded generation projects under rule 5.18B; and	<a href="#">Register of completed embedded generation projects</a>
<b>5.3A.3(a)(3)</b>	an information pack.	Embedded generation connection guidelines – information pack.
<b>5.3A.3(b)</b>	An information pack must include:	
<b>5.3A.3(b)(1)</b>	<i>a description of the process for lodging an application to connect for an embedded generating unit, including:</i>	Section 4, Section 5, Section 6, Section 7
<b>5.3A.3(b)(1)(i)</b>	<i>the purpose of each stage of the connection enquiry and application processes;</i>	Section 4, Section 5, Section 6, Section 7
<b>5.3A.3(b)(1)(ii)</b>	<i>the steps a Connection Applicant will need to follow at each stage of the connection enquiry and application processes;</i>	Section 4, Section 5, Section 6, Section 7
<b>5.3A.3(b)(1)(iii)</b>	<i>the information that is to be included by the Connection Applicant with a connection enquiry and the information that will be made available to the Connection Applicant by the Distribution Network Service Provider at each stage of the connection enquiry;</i>	Section 4, Section 5, Section 6, Section 7
<b>5.3A.3(b)(1)(iv)</b>	<i>the information that is to be included with an application to connect and the type of information that will be made available to the Connection Applicant by the Distribution Network Service Provider after lodgment of the application;</i>	Section 4, Section 5, Section 6, Section 7
<b>5.3A.3(b)(1)(v)</b>	<i>the factors taken into account by the Distribution Network Service Provider, at each stage of the connection enquiry and application, when assessing an application to connect for an embedded generating unit;</i>	Section 4.5, Section 5, Section 6, Section 7



NT NER CLAUSE	REQUIREMENT	POWER AND WATER'S DEMONSTRATION OF COMPLIANCE OBLIGATIONS
5.3A.3(b)(1)(vi)	<i>the process for negotiating any access standards, where allowed under jurisdictional electricity legislation and a summary of the factors the Distribution Network Service Provider takes into account when considering proposed changes to access standards; and</i>	Section 5, Section 6, Section 7
5.3A.3(b)(1)(vii)	<i>a list of services, if any, relevant to the connection that are contestable in the relevant participating jurisdiction;</i>	Section 8
5.3A.3(b)(2)	single line diagrams of the Distribution Network Service Provider's preferred connection arrangements, and a range of other possible connection arrangements for integration of an embedded generating unit, showing the connection point, the point of common coupling, the embedded generating unit(s), load(s), meter(s), circuit breaker(s) and isolator(s);	Section 3
5.3A.3(b)(3)	a sample schematic diagram of the protection system and control system relevant to the connection of an embedded generating unit to the distribution network, showing the protection system and control system, including all relevant current circuits, relay potential circuits, alarm and monitoring circuits, back-up systems and parameters of protection and control system elements;	Section 3
5.3A.3(b)(4)	worked examples of connection service charges, enquiry and application fees for the connection of embedded generating units, based on the preferred and possible connection arrangements set out in paragraph (b)(2);	Appendix 4
5.3A.3(b)(5)	details of any minimum access standards or plant standards the Distribution Network Service Provider considers are applicable to embedded generating units and generating plant;	Section 6.4.1, Section 7.4.1
5.3A.3(b)(6)	technical requirements relevant to the processing of a connection enquiry or an application to connect, including information of the type, but not limited to:	Section 3
5.3A.3(b)(6)(i)	<i>protection systems and protection schemes;</i>	Section 3
5.3A.3(b)(6)(ii)	<i>fault level management principles;</i>	Section 3



NT NER CLAUSE	REQUIREMENT	POWER AND WATER'S DEMONSTRATION OF COMPLIANCE OBLIGATIONS
5.3A.3(b)(6)(iii)	<i>reactive power capability and power factor correction;</i>	Section 3
5.3A.3(b)(6)(iv)	<i>power quality and how limits are allocated;</i>	Section 3
5.3A.3(b)(6)(v)	<i>responses to frequency and voltage disturbances;</i>	Section 3
5.3A.3(b)(6)(vi)	<i>voltage control and regulation;</i>	Section 3
5.3A.3(b)(6)(vii)	<i>remote monitoring equipment, control and communication requirements;</i>	Section 3
5.3A.3(b)(6)(viii)	<i>earthing requirements and other relevant safety requirements;</i>	Section 3
5.3A.3(b)(6)(ix)	<i>circumstances in which augmentation may be required to facilitate integration of an embedded generating unit into the network;</i>	Section 3
5.3A.3(b)(6)(x)	<i>commissioning and testing requirements;</i>	Section 3
5.3A.3(b)(6)(xi)	<i>circumstances in which a system strength remediation scheme or system strength connection works will be required as a condition of connection; and</i>	Section 3
5.3A.3(b)(6)(xii)	<i>other technical matters relevant to any access standard under jurisdictional electricity legislation; and</i>	Section 3
5.3A.3(b)(7)	model connection agreements used by that Distribution Network Service Provider.	Section 4.4, Section 5.5, Section 6.6, Section 7.5