Embedded generators 5MW and greater

Application guidelines

Asset and Network Planning

February 2015

Endeavour Energy

CONTENTS

Document Amendment History

Version No.	Publication Date	Prepared By	Comments
0.1	Sep 2014	Asset and Network Planning	
0.2	Feb 2015	Asset and Network Planning	Section 2.0, 4.0 added. Section 3.0, 5.0 amended, Annexure B renamed.

Disclaimer

Endeavour Energy may change the information in this document without notice. All changes take effect on the date made by Endeavour Energy.

1.0 Overview

These application guidelines provide details of the application process for embedded generators 5MW or greater seeking to connect to the Endeavour Energy network.

AEMO has issued a standing exemption from registration for generation systems with a nameplate rating of less than 5MW as detailed in the AEMO publication *NEM generation registration guide*.

Exempt embedded generators will need to refer to the Endeavour Energy website which contains a section on 'small and medium embedded non-registered generator connection services'.

2.0 References

These guidelines will need to be read in conjunction with the following documents available on the Endeavour Energy website. Links have been provided to the current versions of these documents at the time of writing this document.

- The Endeavour Energy Connection Policy;
- The Endeavour Energy Network Price List; and
- The Endeavour Energy Model Generator connection agreement.

3.0 Application process

The application process includes a preliminary enquiry stage followed by a detailed enquiry stage. A fee is charged at the detailed enquiry stage. The overall process is summarised in the flowchart in Annexure A. Each stage of the process is detailed below:

3.1 Preliminary enquiry

A connection applicant can complete the embedded generator connections 5MW and greater enquiry form FPJ7004 available on the Endeavour Energy website to lodge a generator enquiry. The minimum information to be submitted with the application form which is necessary to commence a preliminary enquiry includes the requirements of Schedule 5.4 of the National Electricity Rules (NER), a description of the objectives of the generator proposal, the preferred voltage of connection and a preliminary single line diagram of the proposed installation showing the proposed generator connection arrangement.

Within 5 business days of receipt of the enquiry form an acknowledgement letter will be issued to the applicant and if the enquiry is incomplete in any material way then the acknowledgement letter will include a request for additional information.

Unless otherwise agreed, within 15 business days of receipt of the enquiry and any additional information requested, Endeavour Energy will provide a response including the information specified in Schedule 5.4A of the NER. This includes:

- Preliminary protection, control and monitoring requirements applicable to the embedded generator as specified in the relevant Endeavour Energy and Australian Standards;
- Metering requirements as specified in the Endeavour Energy Standards;
- Insulation coordination and lightning protection requirements as specified in the relevant Endeavour Energy and Australian Standards;
- Comments on the proposed switching and isolation facilities;
- Comments on the interlocking and synchronising requirements for the proposed plant;
- Existing maximum and minimum fault levels and fault clearance times of relevant local zone substations, if applicable;
- Information on network constraints relevant to the connection;
- Overview of options for connecting to the Endeavour Energy network relevant to the connection point;
- An indication of network augmentation or extension works which may be required;

- A statement of additional information which will need to be submitted by the applicant to lodge a detailed enquiry;
- The enquiry fee for conducting a detailed enquiry and the basis for calculating the fees;
- An estimate of the application fee which is payable when submitting an application to connect; and,
- The aspects of the response which may change following the detailed enquiry.

A connection applicant may choose to skip the preliminary response stage by completing an enquiry form and requesting Endeavour Energy to proceed directly to the detailed response. In this instance the applicant will need to submit the enquiry form together with all the required information for a detailed response and pay the detailed enquiry fee. Section 2.2 states the information associated with a detailed response.

3.2 Detailed enquiry

Following the preliminary enquiry response, a connection applicant may request a detailed enquiry response by submitting the information requested in the preliminary enquiry response in a timely manner[1] and paying the required enquiry fee.

Endeavour Energy will acknowledge receipt of the request for a detailed enquiry response within 5 business days and advise the applicant of any missing information within 10 business days after receiving the request for a detailed enquiry response.

Once all the required information has been received, Endeavour Energy will, unless otherwise agreed provide a detailed enquiry response within 30 business days. The detailed response will include information specified in Schedule 5.4B of the NER. This includes:

- Details of the connection requirements including the voltage levels;
- Details of any applicable standards;
- Levels of the power transfer capability of the network at the point of connection, if applicable;
- Details of automatic access standards and minimum access standards which apply to the proposed connection as stated in the National Electricity Rules (refer to Section 5.2 of these guidelines);
- The process to request negotiated access standards in conjunction with AEMO;
- Other technical details specific to the connection which will need to be included with the application;
- An itemised estimate of the connection costs;
- A draft generator connection agreement which contains the proposed terms and conditions;
- A description of the process to lodge an application including the application fees.

The connection applicant can consider the information provided and decide whether or not they wish to lodge a connection application.

3.3 Application to connect

Following the detailed enquiry response stage, a connection applicant will be required to submit a completed application form. The application form is to be submitted with all the specified information identified in the detailed enquiry response including the information specified in Schedule 5.5 of the NER, and payment of the applicable fee.

Endeavour Energy will review the application and if incomplete, will within 10 business days advise the applicant of the requirements.

[1] Applicants should attempt to request a detailed enquiry and submit the information requested in a timely manner as late responses may incur additional costs if any additional work is required.

Once the application has been accepted, Endeavour Energy will consult with all relevant stakeholders before issuing the applicant an offer to connect. An offer will be issued within 4 months of receipt of the complete application unless an extension has been agreed by the applicant. The offer to connect will include an itemised statement of connection costs.

The connection applicant will then have 20 business days, or an alternative period as agreed with Endeavour Energy, to review and accept the offer to connect an enter into a Generator Connection Agreement. A Model Generator connection agreement can be found on the Endeavour Energy Website.

3.4 Assessing the application

Endeavour Energy has a requirement to maintain power transfer capability, power quality and system stability as specified in Chapter 5 of the National Electricity Rules. When assessing a connection application the following considerations will be taken into account at each stage of the application process.

- Safety concerns: This is influenced by the protection, isolation, earthing, insulation and anti-islanding requirements of the proposed generation plant.
- The impact of the connection on the network: The available network capacity and power transfer capability of the proposed site will be assessed. This assessment will also include investigating the effect of the generation plant on the power quality and stability of the network. As assessment of the voltage levels and fault levels will also be required.
- Operational issues: The network configuration may change due to planned and unplanned maintenance activities, which may impact on the generator operation. Long terms impacts of the operation of the proposed generator on the network will also need to be assessed.

3.5 Contestable Connection Services

The *Electricity Supply Act 1995* specifies requirements relating to the provision of customer connection services and allows customers to choose suppliers for providing those services - these are contestable works (please refer to the NSW Trade and Investment Code of Practice – Contestable Works). Design, construction and connection works for network extensions and augmentations will generally be considered contestable connection services.

Where work needs to be done on critical or high risk assets, these works will be customer funded services provided by Endeavour Energy. Works fitting this category will be determined by Endeavour Energy and based on concerns for safety, reliability or the critical nature of the works. A list of Endeavour Energy provided services and the associated charges can also be found in the Endeavour Energy Network Price List. Please refer to the Endeavour Energy Connection Policy for more details on contestable connection works.

Customers are required to engage Accredited Service Providers (ASP) of their choice to undertake these works and will be separately liable to those Accredited Service Providers for costs related to those works. Contestable connection works must be carried out in accordance with Endeavour Energy's Standard Connection Service and associated Model Standing Offer for Standard Connection Service for Customers

Any work on the Endeavour Energy network will need to be conducted by Accredited Service Providers whose personnel are authorised to work on the Endeavour Energy network and can demonstrate an understanding of Endeavour Energy's Electrical Safety Rules.

Ancillary Network Services are provided by Endeavour Energy to cover our interactions with ASPs to ensure that the connection works undertaken by ASPs meet appropriate design and technical requirements to be connected to and form part of our network. The list of Ancillary Services and charges can be found in the Endeavour Energy Network Price List.

4.0 Charges

4.1 Connection Charges

User pays principles are applied to connection works associated with extending the network to establish a connection point or augmentations of the existing network. Since the proponent of these works must fund them, they can engage their own designers and constructors to complete these contestable connection works.

Endeavour Energy will facilitate the contestable connection works by providing administration, design information, audit and project management services and collects costs by way of fees. All fees will be calculated using the hourly labour rates set by the AER and listed in the Endeavour Energy Network Price List located on Endeavour Energy's website under Fees, charges and bonds. Where consultants are engaged to assist with processing the application their costs will be passed through with a 5% handling charge. Other stakeholder costs, if any, will be passed through without a handling charge.

Fees or charges applicable to contestable connection works and other network connection charges can be found in the Endeavour Energy Connection Policy available on the Endeavour Energy website.

4.2 Enquiry Fee

The detailed enquiry fee will be based on the level of work required by Endeavour Energy to conduct a detailed enquiry response and will vary from generator to generator. For small generators an estimate of the detailed enquiry would be around $5,000. However as the capacity increases and the impact on the network becomes more significant, a larger involvement with stakeholders will be required increasing the estimate of the detailed enquiry fee to about $20,000 for generators up to 10MW and increasing to over $30,000 for generators above 10MW. An example of the enquiry fee is provided below[2].

Example for a 30MW – 100 MW (large) generator connection application:

Coordinating and processing the connection enquiry.	80 hours ($8,700)
Conducting network studies to confirm protection requirements, assessing voltage levels and the power transfer capability of the network.	120 hours ($13,000)
Development of connection options and a budget estimate.	100 hours ($10,900)
Detailed Enquiry Fee Total	300 hours ($32,600)

4.3 Application Fee

Similar to the detailed enquiry fee, the application fee will depend on the level of work required by Endeavour Energy to review and assess a generator connection application and will vary from generator to generator. Details of the application fee specific to the generator connection application will be provided with the detailed response, however an example is provided below[3]:

Example for a 30MW – 100 MW (large) generator connection application:

Coordinating, processing and assessing the connection application	120 hours ($13,000)
Review of the power transfer capability of the network at the point of connection and the generator access standards	225 hours ($24,500)
Review of the applicant's protection and fault level submission	270 hours ($29,400)
Development of the draft Offer to Connect	65 hours ($7,100)

[2] Note that this is an estimate only for a typical connection of this size, based on the hourly rate for an engineer (R3), stated in the Endeavour Energy Network Price List at the date of publishing this guideline. The actual cost will depend on the cost incurred by Endeavour Energy in processing the detailed enquiry.

[3] Note that this is an estimate only for a typical connection of this size, based on the hourly rate for an engineer (R3), stated in the Endeavour Energy Network Price List at the date of publishing this guideline. The actual cost will depend on the cost incurred by Endeavour Energy in processing the application.

Development of the project definition	160 hours ($17,500)
Connection Application Fee Total	840 hours ($91,500)

The above estimates for the enquiry fee and application fee exclude the following charges which will be passed through to the customer:

- Consultant studies, specialist reports and other stakeholder involvement;
- Ancillary service fees;
- Protection testing and commissioning charges that may apply subject to the scope of work.

5.0 Generator Technical Requirements

5.1 Standards and regulations

The Service and Installation Rules of NSW state the technical requirements that apply to connections to the Endeavour Energy network. Endeavour Energy standards are also available providing additional information that apply to the design, construction and operation of network connections and substations. All standards are on the ASP Website and can be accessed via your Accredited Service Provider.

Endeavour Energy's Protection Design Instruction PDI 5000 is available in the Endeavour Energy website under Embedded generators 5MW and greater as this standard details specific protection requirements for embedded generation systems. The current versions of other Endeavour Energy specific standards or requirements which apply to the generator connection application will be provided in the preliminary and/or detailed enquiry response.

Connection applicants should also refer to the National Electricity Rules available on the Australian Energy Market Commission Website as the schedules in Chapter 5 details specific technical requirements applicable for generators. Relevant automatic and minimum access standards are discussed in section 5.2.

5.2 Automatic and minimum access standards

It is preferred that the generator meets the automatic access standards stated in the National Electricity Rules Chapter 5 Schedule 5.2 – Conditions for connection of generators available on the Australian Energy Market Commission Website. The relevant schedules listed below are also located in the Model Generator Connection Agreement, available on the Endeavour Energy website.

- Reactive power capability (S5.2.5.1);
- Quality of electricity generated (S5.2.5.2);
- Generating unit response to frequency disturbances (S5.2.5.3);
- Partial load rejection (S5.2.5.7);
- Protection of generating units from power system disturbances (S5.2.5.8);
- Protection systems that impact on power system security (S5.2.5.9);
- Asynchronous operation of synchronous generating units (S5.2.5.10);
- Frequency Control (S5.2.5.11);
- Stability (S5.2.5.12);
- Excitation control system (S5.2.5.13);
- Remote monitoring (S5.2.6.1);
- Communications equipment (S5.2.6.2);
- Fault level (S5.2.8).

Should the generation applicant not be able to meet the automatic access standard, a proposal for a negotiated access standard will need to be submitted which must comply with the NER Chapter 5 and must not be below the minimum access standards stated in the National Electricity Rules.

Details of minimum access standards can be found under the above schedules listed in the National Electricity Rules Chapter 5 Schedule 5.2 available on the Australian Energy Market Commission Website.

5.3 Negotiated access standards

As stated above, should the connection applicant differ from the technical requirements stated in the automatic access standards, a proposal for negotiated access standards will need to be submitted.

Once the need for a negotiated access standard has been identified, Endeavour Energy will advise the connection applicant of the information that they will need to prepare to support the proposed negotiated access standard. The applicant will be informed of AEMO and/or other stakeholders involvement together with their passed through costs.

Once the proposal has been submitted, Endeavour Energy will conduct a due diligence study on the processed access standard to assess any impacts on the network before submitting the proposal to AEMO.

A time frame for negotiations will be discussed in the initial stages of consultations and will vary depending on the extent of due diligence activities required. Typically this process takes about two months but may vary depending on the size of the project.

5.4 Voltage Levels for Connections

The maximum generator output that may be connected at each voltage level will be assessed on an individual basis. The table below provides indicative voltage levels at which embedded generators can connect to the network.

Consideration may be given in special situations to permit higher outputs at each voltage level in the network where the capacity is available in the network and there are identified advantages to Endeavour Energy in doing so.

Table 1 Voltage levels for Embedded Generator connections

Network Connection Voltage	Maximum Generator Output
22kV	5MW
33kV	20MW
66kV	30MW
132kV	100MW

5.5 Preferred Connection Arrangements

Embedded generator connection arrangements will be assessed on an individual basis and will depend on the generator requirements and the available network capacity. The connection arrangement together with the metering arrangements will need to comply with all relevant Australian Standards, Endeavour Energy standards and technical requirements.

A sample schematic of an embedded generator connection arrangement to Endeavour Energy's network is shown in Annexure B. This schematic shows typical protection schemes, major equipment and the interface between the customer and Endeavour Energy. This schematic is only indicative as customers will be required to design protection schemes and general arrangements as per the network requirements at the point of connection.

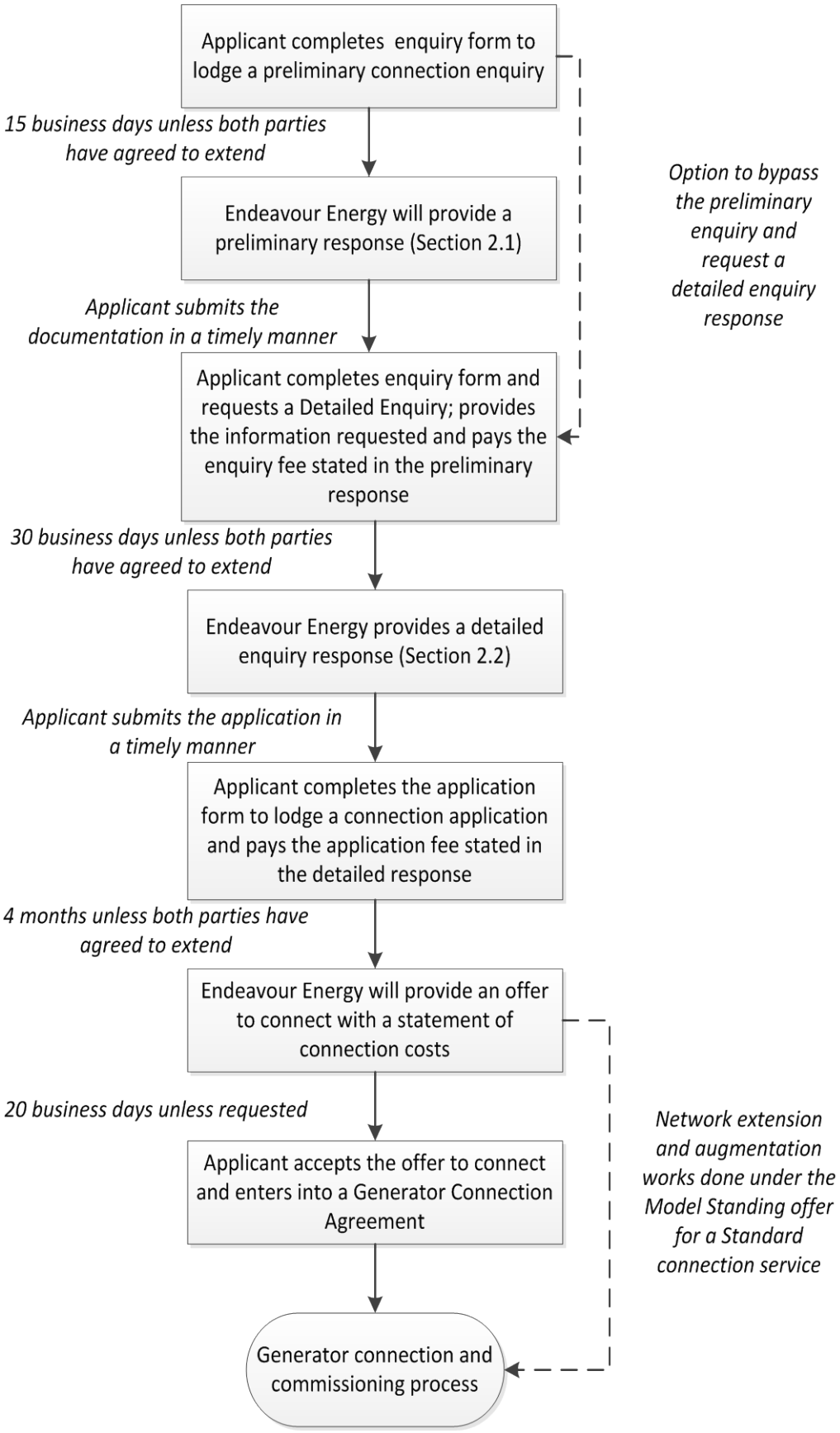
6.0 Dispute resolution

The Connection Applicant may ask Endeavour Energy to review its decisions and processes in relation to the Connection Offer.

Embedded Generation applicants can seek assistance in resolving disputes on technical and other matters arising during the connection process through the Dispute Resolution Advisor appointed by the AER and in accordance with Chapter 8 of the National Electricity Rules.

Endeavour Energy's procedures for dealing with complaints, disputes and requests for review of its decisions are set out in the Endeavour Energy Procedures for Customer Complaints, Appeals and Disputes which are available on request, and on Endeavour Energy's website at **www.endeavourenergy.com.au**.

Annexure A – Application Process



Note: Late submissions may incur additional costs if any additional work is required.

Annexure B – Preferred Connection Arrangement

Sample Schematic of a Generator Connection Arrangement to Endeavour Energy's Network