Energy Networks Australia

Distributed Energy Resources Grid Connection Guidelines

Framework and Principles

MAY 2018

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Contents

Definitions*

Basic micro EG connection	*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*
Embedded generating unit	*A generating unit connected within a distribution network not having direct access to the transmission network*
Distributed Energy Resources	Power generation or storage units that are connected directly to the distribution network
Generating system	*A system comprising one or more generating units*
Generating unit	*The plant used in the production of electricity and all related equipment essential to its functioning as a single entity*
Generation	*The production of electrical power by converting another form of energy in a generating unit*
Generator	*A person who owns, operates or controls a generating unit*
High voltage	Any voltage greater than 35kV
Low voltage	The mains voltages as most commonly used in any given network by domestic and light industrial and commercial consumers (typically 230V)
Medium voltage	Any voltage greater than low voltage and less than high voltage
Microembedded generating unit	*An embedded generating unit of the kind contemplated by Australian Standard AS 4777 (Grid connection of energy systems via inverters) currently up to 200kVA*
Market generating unit	*A generating unit whose generation is not purchased in its entirety by a retailer (and receive payment for generation through the NEM or WEM)*
Model standing offer	*A document approved by the AER as a model standing offer to 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*
Negotiated connection	*A connection of an embedded generating unit which is neither a basic micro EG connection or a standard connection for which technical requirements are negotiated between the DNSP and the proponent*
Proponent	A person proposing to become a generator (the relevant owner, operator or controller of the generating unit (or their agent))
Registered generator	*A person who owns, operates or controls a generating unit that is connected to, or who otherwise supplies electricity to, a transmission or distribution system and who is registered by AEMO as a Generator under Chapter 2 of the National Electricity Rules*
Registered generator connection	*A connection of a generating unit by a registered generator*
Small generation aggregator	*A person who has classified one or more small generating units as a market generating unit*
Small registered generator	*A generator who elects to register a generator with AEMO as a market generating unit who would otherwise be entitled to an exemption to register based on size*
Standard connection	*A connection of embedded generating unit which is not basic and for which a model standing offer is in place*

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

Forward

Background

The electricity industry in Australia is undergoing a transformation from a centralised system of generation transmission and distribution, dominated by relatively few players, to a system of increasing decentralisation. The transformation is being largely driven by technological change in renewable and distributed energy resources (DER), enabling a broader range of stakeholders, including retail customers, to connect to and participate in existing and emerging energy markets.

As a result, network businesses are transforming from network service providers, facilitating one-way flow, to a customer connection provider, facilitating two way flows between multiple distributed generating units and load. The rate of transformation varies between networks due to the rate of uptake of DER and differing characteristics of network types.

Each network has responded to these challenges independently, resulting in a range of technical requirements and connection processes which, although consistent with local regulatory requirements, result in some inconsistencies between networks and a lack of clarity for proponents. These issues have been identified as a major concern by stakeholders in numerous industry reports and reviews including the CSIRO/ Energy Network Australia's Energy Network Transformation Roadmap[1], and the Clean Energy Council's Future Proofing Australia's Distribution Networks[2].

The Finkel Review[3] also identified a number of challenges associated with the integration of DER which will require modernised connection standards and uniform control mechanisms. The Finkel Review recommended the development of Energy Security Obligations by mid-2018 that includes a holistic review and update of connection standards.

About the National DER Connection Guidelines

The National DER Connection Guidelines set out the framework, principles, approach and technical settings for Australian Network Service Providers to adopt in the development and application of their technical requirements for grid connection of DER. The ultimate aim of the guidelines is to facilitate the fair & efficient integration of DER into the grid from the perspective of both network, renewable energy proponents and Australia's electricity system more generally.

While at this stage the guidelines are a voluntary industry code, all Australian network service providers have communicated an intention to adopt the requirements of the guidelines.

This Framework and Principles Guideline represents the first of five guideline documents. The Framework and Principles Guideline contains the principles, objectives, structure and framework for Australian Network Service Providers to adopt within their own documents and procedures for connection of DER. The Framework and Principles guideline will be followed by four subsequent technical guidelines which detail the specific technical requirements for network connection to be adopted by network service providers and required to be followed by proponents.

In preparing these guidelines, Energy Networks Australia has consulted broadly with industry including the Australian Energy Market Operator, the Australian Energy Market Commission, the Australian Energy Regulator, the Clean Energy Council and Energy Consumers Australia as well as each of the 21 network service providers across Australia, who are our member organisations. Individual proponents and equipment manufacturers have also been engaged via a series of public webinars.

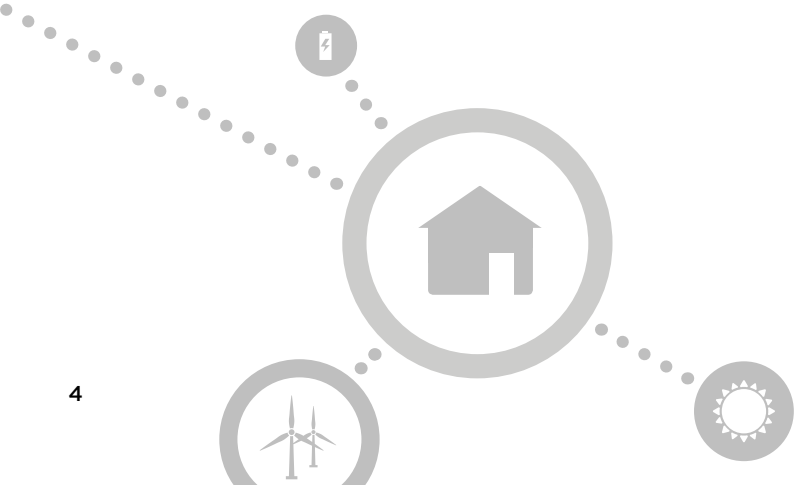
1 www.energynetworks.com.au/electricity-network-transformation-roadmap

2 http://fpdi.cleanenergycouncil.org.au/reports/grid-connection-standards-scoping-study.html

3 https://www.energy.gov.au/government-priorities/energy-markets/independent-review-future-security-national-electricity-market

Abbreviations

AS	Australian Standard
DER	Distributed Energy Resources
DNSP	Distribution network service provider
HV	High voltage
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers (US)
IES	Inverter Energy System
LV	Low voltage
MV	Medium voltage
NEM	National Electricity Market
NER	National Electricity Rules
NSP	Network Service Provider
SWIS	South West Interconnected System
TNSP	Transmission Network Service Provider
WEM	Wholesale Electricity Market servicing the South West Interconnected System



1 Introduction

1.1 About the guidelines

The Australian Distributed Energy Resources (DER) Network Connection Guidelines set out the framework, principles, approach and technical settings Australian Network Service Providers (NSPs) shall adopt in the development and application of their technical requirements for grid connection of DER.

The objectives of the guidelines are to:

- Give rise to clear and complete technical requirements for grid connection for each Australian DNSP
- Provide for a level of consistency between Australian DNSPs' technical requirements for grid connection in terms of both structure of presentation and the requirements themselves
- Ensure that DNSPs technical requirements are consistent with the National Electricity Objective. That is, that the technical requirements give regard to the long-term interest of consumers by appropriately balancing the economic benefits, costs and risks that the requirements impose upon the network, proponents and Australia's electricity system more generally.

1.2 Structure of guidelines

The guidelines are separated into five distinct documents:

1. Framework and principles guideline (this document) – Specifies the number, scope and structure of the technical guidelines which all NSPs shall adopt and the principles NSPs shall adopt in setting technical requirements.
2. Basic micro EG connection technical guidelines – Specifies the technical requirements for connection of a micro EG generating unit of up to 30kVA three phase or 10kVA per phase to a distribution network.
3. Low voltage connection technical guidelines – Specifies the technical requirements for connection of a generating unit (which is not a basic micro-EG generating unit) to a low voltage distribution network.
4. Medium voltage connection technical guidelines – Specifies the technical requirements for connection of a generating unit (which is not a basic micro-EG generating unit) to a medium voltage distribution network.
5. High voltage connection technical guidelines – Specifies the technical requirements for connection to a generating unit (which is not a basic micro-EG generating unit) to the high voltage distribution for which the generator is not required to register with AEMO (typically less than 5MW).

At this stage, the guidelines do not apply to registered generators with a generating unit greater than 5MW in the National Electricity Market or 10MW in the Western Australian Energy Market[4]. Connection requirements and connection processes for these registered generators are currently undergoing change as a result of a number of proposed and recent revisions to the National Electricity Rules. The need for the guidelines to extend to these registered generators (connecting to both distribution and transmission networks) will be reviewed following the finalisation and implementation of these Rule changes.

4 Note the guidelines still apply to generators who elect to register with AEMO as either a small registered generator or a small generation aggregator operating individual generating units of less than 5MW

1.3 What is the intent of these guidelines?

These guidelines are intended to be read by all Australian NSPs to guide the development and management of the documentation establishing the technical requirements for the connection of distributed energy resources to their network. The guidelines are most applicable to DNSPs, however, the general principles also apply to TNSPs.

The guidelines may also be read by proponents and other interested parties seeking to navigate and understand the technical requirements for connection to Australian networks.

1.4 How to comply with the guidelines

The guidelines are a voluntary industry code and compliance is therefore not at this stage legally required by NSPs.

Notwithstanding, to be deemed to comply with the guidelines, NSPs shall:

- Structure their technical requirements consistent with the framework and principles set out in this document
- Directly adopt the requirements set out in the subsequent technical guidelines as relevant.

Where DNSPs choose to adopt an alternative setting, structure or approach, they shall still be deemed to comply so long as the alternative setting is justified within their own technical guidelines. Justification shall include how the alternative setting either responds to jurisdictional requirements and/or how the alternative settings promote improved benefits to Australia's electricity system (in terms of both network and proponent benefits, risks and costs).

The need for a mandatory code shall be considered as part of the review and evaluation of this document (See Section 6).

1.5 Terminology

In this document the following terminology is used:

- The word **shall** indicates that adopting the setting is mandatory in order for NSPs to be deemed to comply with these guidelines
- The word **may** indicates an optional setting that NSPs shall consider, but will still be deemed to comply with the guidelines if they do not adopt that setting
- The word **must** indicates a legal requirement with which NSPs must comply unless otherwise specified.

1.6 Relationship to other documents

1.6.1 Legislation, regulation and industry codes

The guidelines are intended to be consistent with and complement existing legislation, regulation and industry codes.

The two main pieces of regulation in terms of defining connection types, connection processes and technical requirements are:

- National Electricity Rules – specifies the procedural requirements for connections and requirements for NSPs to publish certain information requirements within the NEM by connection types
- Western Australia Access Code - specifies the procedural requirements for connections by connection type and requirements for NSPs to publish certain information requirements within the SWIS.

There are a range of other jurisdictional legislation, regulation and industry codes which define connection types and requirements, and network standards as summarised in Table 1 below.

Table 1 – Related legislation, regulation and industry codes

State/ Territory	Document title	Applicable NSP connection	Includes definitions of connection types?	Includes technical requirements?	Legally binding?	Description
QLD	Queensland Electrical Safety Act 2002	All Queensland NSPs	No	Network standards and/or outcomes to be achieved only	Yes	Establishes a legislative framework for preventing persons from being killed or injured by electricity and preventing property from being destroyed or damaged by electricity
QLD	Electricity Act 1994	All Queensland NSPs	No	Network standards and/or outcomes to be achieved only	Yes	Sets out the legal and regulatory framework for all electricity industry participants while promoting an efficient, economical, environmentally sound and competitive electricity market
QLD	Queensland Electricity Connection and Metering Manual	All Queensland NSPs	No	Yes	No	Promotes industry uniformity through standardisation of connection and metering practices throughout Queensland
NSW	Electricity Supply Act 1995	All Queensland NSPs	N/A	N/A	Yes	Promotes efficiency, environmental responsibility, safety and reliability and regulates network operations and electricity supply
NSW	Service and Installation Rules of New South Wales	All NSW NSPs	No	Yes	No	Covers the requirements for the connection of electrical installations to NSW distribution networks
ACT	Electricity Service and Installation Rules Code	ACT NSPs (Evoenergy)	No	No	Yes	Requires electricity distributors to develop electricity service and installation rules that set out the requirements and associated obligations and procedures for the safe, reliable and efficient connection of electrical installations to an electricity network
VIC	Electricity Distribution Code (Version 9)	All Vic DNSPs	No	Yes	Yes	Regulates the distribution of electricity, connections to distribution networks, and the transfer of electricity between distribution systems so that they are undertaken in a safe, efficient, and reliable manner

State/ Territory	Document title	Applicable NSP connection	Includes definitions of connection types?	Includes technical requirements?	Legally binding?	Description
VIC	Electricity Industry Guideline 15 - Connection of Embedded Generation	All Vic DNSPs	No	No	Yes	Provides arrangements for connecting embedded generating units to distribution systems
VIC	Victorian Service and Installation Rules	All Vic NSPs	No	Yes	Yes	Provides industry agreed technical requirements that meet all legislative and code requirements for the supply and metering related aspects of any connection to the Victorian electricity supply networks
SA	Electricity Distribution Code	SA DNSPs (SA Power Networks)	No	No	Yes	Regulates the conduct or operations of distributors, and embedded generators which are not registered under the National Electricity Rules
SA	Service and Installation Rules	All SA NSPs	No	Yes	No	Sets out our requirements for connecting an electrical installation to the SA Power Networks distribution network
SA	2017 Model License Conditions for New Generators	All SA NSPs	No	No	Yes	Sets out technical requirements and conditions for generators seeking a licence
SA	Office of the Technical Regulator Generator Development Approval procedure	All SA NSPs	No	Yes	Yes	Sets out technical and process requirements for generators seeking a development approval
TAS	Tasmanian Electricity Code	All Tasmanian NSPs (TasNetworks)	No	Yes	Yes	Regulates in a safe, efficient and reliable manner the supply of electricity as well as customers' electrical installations and connections
TAS	Electricity Supply Industry Act 1995	All Tasmanian NSPs (TasNetworks)	No	No	Yes	Promotes efficiency, safety and competition in the electricity supply industry, enforces proper standards in the performance of electrical work, and protects the interests of consumers
WA	Electricity Act 1945	All WA NSPs	No	No	Yes	Protects the community, by ensuring the safety of electricity supply systems and by ensuring consumers receive supplies that meet appropriate standards of quality, reliability and metering accuracy

State/ Territory	Document title	Applicable NSP connection	Includes definitions of connection types?	Includes technical requirements?	Legally binding?	Description
WA	Electricity (Licensing) Regulations 1991	All WA NSPs	No	No	Yes	Covers standards of electrical work on consumers' installations, licensing of electrical workers and contractors and procedural matters
WA	WA Electrical Requirements	All WA NSPs	No	No	Yes	Sets out minimum requirements for all electrical installations in WA. Network operators may prescribe additional or enhanced requirements as a condition of connection to their networks
WA	Electricity Networks Access Codes	Only Western Power	Yes	Network standards and/or outcomes to be achieved only	Yes (for Western Power)	Provides the framework for independent regulation of certain electricity networks and promotes the economically efficient investment in, and operation and use of, networks and services of networks in Western Australia to promote competition
WA	Electricity Industry Code 2005	All WA NSPs	No	Yes	Yes	Sets out standards and obligations around network quality and reliability of supply
WA	Western Power Technical Rules	Western Power	Yes	Yes	Yes	Contains the technical requirements that must be met by Western Power and all users of Western Power's network
WA	Western Australian Distribution Connections Manual 2015	All WA DNSPs	Yes	Yes	No	Provides a single point of reference for industry and the community for an electrical connection of a customer's installation to Western Australian distribution networks
NT	Electricity Reform Act	All WA NSPs	No	No	Yes	Promotes the efficiency, competitiveness, and safety of the electricity industry; establishes and enforces standards of safety, reliability and quality of supply; establishes technical standards for installations; protects the interests of consumers
NT	Design and Construction of Network Assets	NT NSPs (Power and Water Corporation)	Yes	No	No	Sets out the design and construction policy associated with the connection of new customers to the electricity network
NT	Network Access Code	NT NSPs (Power and Water Corporation)	No	No	Yes	Regulates third-party access to electricity networks

1.6.2 Australian and International Standards

There are also a number of Australian and International Standards which specify technical requirements for network connections of generating units and/or network performance requirements. Some of these are adopted within the regulations and industry codes described in Table 2.

Table 2 – Related Australian and International Standards[5]

Standard #	Standard Name	Standard Type
AS/NZS 3000	Electrical installations (known as the Australian/ New Zealand Wiring Rules)	Australian/ New Zealand Joint Standard
AS/NZS 4777	Grid connection of energy systems via inverters (multiple parts)	Australian/ New Zealand Joint Standard
AS 60034.1	Rotating electrical machines, Part 1: Rating and performance	Australian Standard
AS 60034.22	Rotating electrical machines, Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating sets	Australian Standard
AS 60044	Instrument transformers (multiple parts)	Australian Standard
AS/NZS IEC 60947.6-1	Low-voltage switchgear and control gear - Multiple function equipment - Automatic transfer switching equipment	Australian/ New Zealand Joint Standard
SA/SNZ TR IEC 61000.3.14	Electromagnetic compatibility (EMC), Part 3.14: Limits—Assessment of emission limits for harmonics, interharmonics, voltage fluctuations and unbalance for the connection of disturbing installations to LV power systems	Australian/ New Zealand Technical Report
SA/SNZ TR IEC 61000.3.15	Electromagnetic compatibility (EMC), Part 3.15: Limits—Assessment of low frequency electromagnetic immunity and emission requirements for dispersed generation systems in LV network	AU/NZ Technical Report
IEC 60255-12	Electrical relays - Part 12: Directional relays and power relays with two input energizing quantities	International Standard
IEC 60255-26	Electrical relays - Part 26: Electromagnetic compatibility requirements	International Standard
IEC 60255-27	Electrical relays - Part 27: Product safety requirements	International Standard
IEC 60255-127	Measuring relays and protection equipment - Part 127: Functional requirements for over/under voltage protection	International Standard
IEC 62109	Safety of power converters for use in photovoltaic power systems	International Standard
IEC 62116	Utility-interconnected photovoltaic inverters – Test procedure of islanding prevention measures	International Standard
IEC 62786	Distributed energy resources connection with the grid	International Standard
IEEE standard 1547-2018	IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems	IEEE Standard

5 The list is not intended to be exhaustive of relevant international standards. There may be other standards being developed or published which are relevant and may be adopted by NSPs within their technical requirements

2. Connecting to the network

2.1 NSP obligations

Under the NER, NSPs have obligations to process and review grid connection applications for generating units.

This means that unlike connections of load, NSPs do not necessarily have an obligation to connect generating units, but moreover have an obligation to process and review applications in a fair and timely manner and to negotiate in good faith. To achieve this, NSPs must provide proponents with information they may reasonably require in order to negotiate on an informed basis.

NSPs within the NEM do not have an obligation to provide a guaranteed level of access to proponents (which means NSPs cannot guarantee proponents ability to earn revenue either from feed-in tariffs or the wholesale market). This is referred to as the open access standard. It should be noted however, that Western Australian networks, operating outside of the NEM, do have an obligation to provide proponents with a guaranteed level of access once this is established via an access offer.

Importantly, all NSPs have an obligation to provide for network safety, security and reliability consistent with both the National Electricity Rules and jurisdictional instruments (which may specify the level of safety, security and reliability to be achieved). Thus, these obligations must be considered in processing and reviewing grid connection applications.

2.2 Proponent obligations

Proponents entering into the connection process have an obligation to negotiate in good faith. This is achieved by providing the NSP information it reasonably requires in order to negotiate on an informed basis as specified by the NSP in its application forms and/or technical and process guidelines.

Once the connection agreement is in place, proponents have an obligation to plan, design and operate generation units to ensure that they comply with the connection agreement. Proponents also have an obligation to comply with the reasonable requirements of the NSP including permitting and participating in inspection, testing, commissioning, maintenance and ongoing compliance monitoring and testing programs.

3. Network connection framework

3.1 Connection types

Each DNSP shall identify distinct connection types according to the five main types described below:

1. **Basic micro EG connection** – Applies to a connection to a distribution network for a generating unit with a size of up to 30kVA for three phase connections or up to 10kVA for single phase connections[6].
2. **Low voltage connection** – Applies to a connection to a low voltage distribution network for an inverter based generating unit (which is not a basic micro-EG generating unit) and any non-inverter based generating unit. In their definition of a low voltage connection, each NSP shall specify the typical maximum capacity for a connection that is able to be accommodated on their low voltage network.
3. **Medium voltage connection** – Applies to a connection to a medium voltage network for an inverter based generating unit (which is not a basic micro-EG generating unit) and any non-inverter based generating unit. Medium voltage connections are connected to the distribution network at a voltage level of between 1kV and 35kV. In their definition of a medium voltage generator connection, each NSP shall specify the typical maximum capacity for a connection that is able to be accommodated on their medium voltage network.
4. **High voltage connection** – Applies to a connection to a high voltage distribution network for an inverter based generating unit (which is not a basic micro-EG generating unit) and any non-inverter based generating unit less than 5MW in the National Electricity Market or 10MW in the Western Australian Energy Market. High voltage connections are connected to the distribution network at a voltage level of greater than 35kV. Generally connections to the transmission network are greater than 5MW and so are classified as registered generator connections (see below).
5. **Registered generator connection** – Applies to any connection by a generator who is required to register with AEMO due to size thresholds. This is typically for generating units greater than 5MW in the National Electricity Market or 10MW in the Western Australian Energy Market. The technical settings for these connection types are not further considered within these guidelines[7].

   Note that generators less than these size thresholds who elect to register with AEMO as either a small registered generator or small aggregation generator, to enable participation in the NEM or WEM, are NOT considered registered generator connections for the purpose of these guidelines (and will be classified as connection type 1, 2, 3 or 4 above).

6 Networks who operate in rural environments, may reduce the single phase threshold to a minimum of 5kVA for the parts of their network where load density is not sufficiently high to accommodate single phase 10kVA generating units. Where this is the case, NSPs shall specify which local government areas the reduced threshold applies.

7 Process requirements are however included in Section 4 for completeness

A summary of the connection types is presented in Table 3 below.

Table 3 – Connection types

Connection Type	Connection voltage	Technology Type	Capacity
Basic micro EG connection	Typically 230V	Micro EG (inverter based and compliant with AS4777)	Less than 30kVA three phase Less than 10kVA single phase[7]
Low voltage connection	Up to 1kV	Inverter based	Greater than 30kVA three phase (up to a maximum capacity able to be accommodated on the low voltage network as specified by each DNSP) Greater than 10kVA single phase[7] (up to a maximum capacity able to be accommodated on the low voltage network as specified by each DNSP)
		Non-inverter based	Any size (up to a maximum capacity able to be accommodated on the low voltage network as specified by each DNSP)
Medium voltage connection	Between 1kV and 35kV	Any	Any size (up to a maximum capacity able to be accommodated on the medium voltage network as specified by each DNSP)
High voltage connection	Greater than 35kV	Any	Less than 5MW for NEM and less than 10MW for WEM
Registered generator connection	Greater than 35kV	Any	Greater than 5MW for NEM and greater than 10MW for WEM

3.2 Standard vs negotiated connections

For each of the low voltage, medium voltage and high voltage generator connection types described above, NSPs may provide both standard and negotiated sub-types of connections[8]. Standard connections are connections which meet a set of pre-determined technical requirements and therefore approval may be automated[9]. Negotiated connections are connection types which may meet some, but do not meet all technical requirements for a standard connection and therefore require negotiation before approval. Standard and negotiated connection types are also defined by Chapter 5A of the National Electricity Rules.

NSPs shall, for each low voltage, medium voltage and high voltage connection type make clear whether their technical requirements are standard or negotiated.

- **Standard technical requirements** – are requirements that are automatically accepted by NSPs. These may be expressed in terms of specific technical settings and/or the network outcomes to be achieved and must be fair and reasonable. Where the settings are expressed as outcomes, the NSP may require the proponent to demonstrate, through technical studies, and validate via testing and commissioning, that the outcome has been achieved.
- **Negotiated technical requirements** – requirements that NSPs may accept subject to the characteristics of the proposed connection and the characteristics of the network at the location of the proposed connection point. These may be expressed in terms of specific technical settings and/or the network outcomes to be achieved. NSPs shall explain how the settings may vary by connection type or location. Where the settings are expressed as outcomes, the NSP may require the proponent to demonstrate, through technical studies, and validate via testing and commissioning that the outcome has been achieved.

Where NSPs provide standard connection type(s), they must[10] also have an AER approved Standard Connection Model Offer in place. The approval process requires the AER to assess whether the technical requirements are fair and reasonable and consistent with the National Electricity Objective.

3.3 Decision tree

In each of its connection guidelines, NSPs shall include a decision tree to assist proponents determine the connection type that is most appropriate. An example decision tree is provided in Figure 1 below. The example decision tree shall be replicated in NSPs technical guidelines adapted for each NSP where indicated[11].

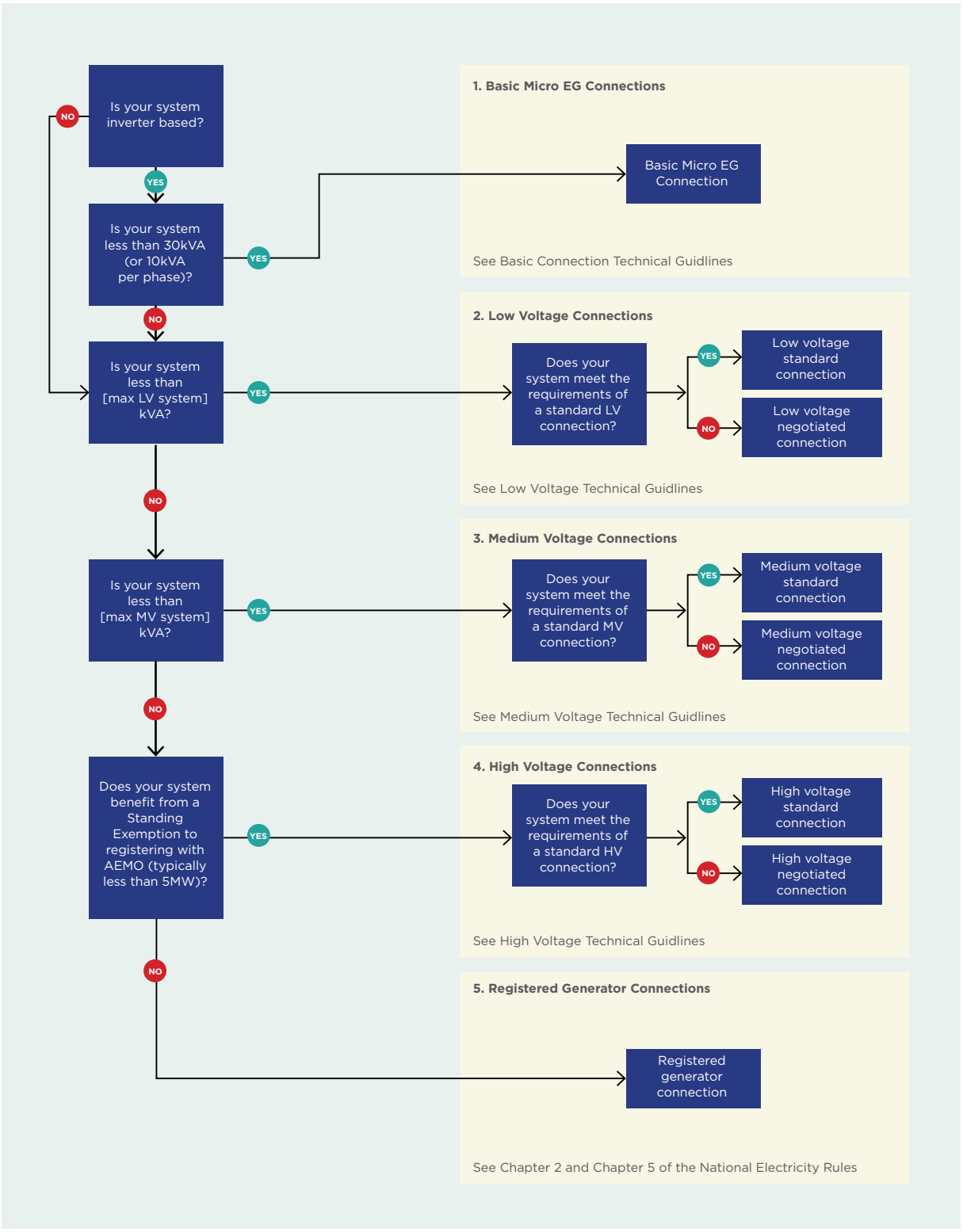
8 An NSP may elect to only include negotiated requirements. This is likely to be the case for Western Australian networks due to its requirement to consider hosting capacity and the use of generation limits.

9 An NSP may detail more than one set of technical requirements which may apply to specific technology types and/or sizes. For example an NSP may choose to create a standard connection type for non-exporting IES generating units of less than 200kVA.

10 Western Power and Horizon Power have no requirement for AER approval

11 [italics] is used to denote where an NSP should insert the relevant setting

Figure 1 – Example Decision Tree for Connection Types



4. Network connection process requirements

The connection process requirements presented below are consistent with the National Electricity Rules and thus impose no additional requirements on NSPs. The exception to this is the requirement for a queuing policy as presented in Section 4.6.

4.1 Overview

NSPs must process and review applications in accordance with the connection process outlined in the National Electricity Rules[12]. There are four types of connections processes outlined in the Rules:

- Basic micro EG connections and standard connections – Chapter 5A, Part F, Division 1 of the National Electricity Rules
- Negotiated connections – Chapter 5A, Part F, Division 2 of the National Electricity Rules
- Registered generator connections distribution connected – Chapter 5.3A of the National Electricity Rules
- Registered generator connections transmission connected – Chapter 5.3 of the National Electricity Rules.

4.2 Basic connections

The basic micro EG connection process is described in Chapter 5A, Part F, Division 1 of the National Electricity Rules, as summarised in Figure 2 below.

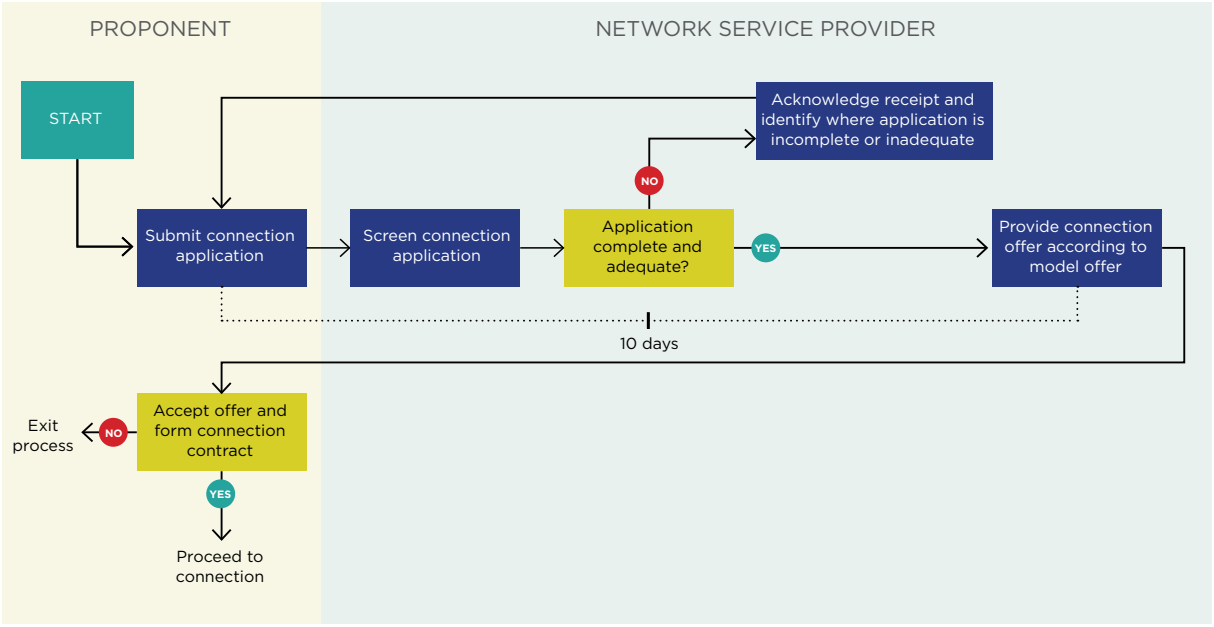
4.3 Low, medium and high voltage connections (distribution connected)

4.3.1 Standard connection

The connection process for a standard connection to either low, medium or high voltage distribution networks is described in Chapter 5A, Part F, Division 1 of the National Electricity Rules, as summarised in Figure 3 below. The process is identical to the basic micro EG connections process but is repeated here for completeness.

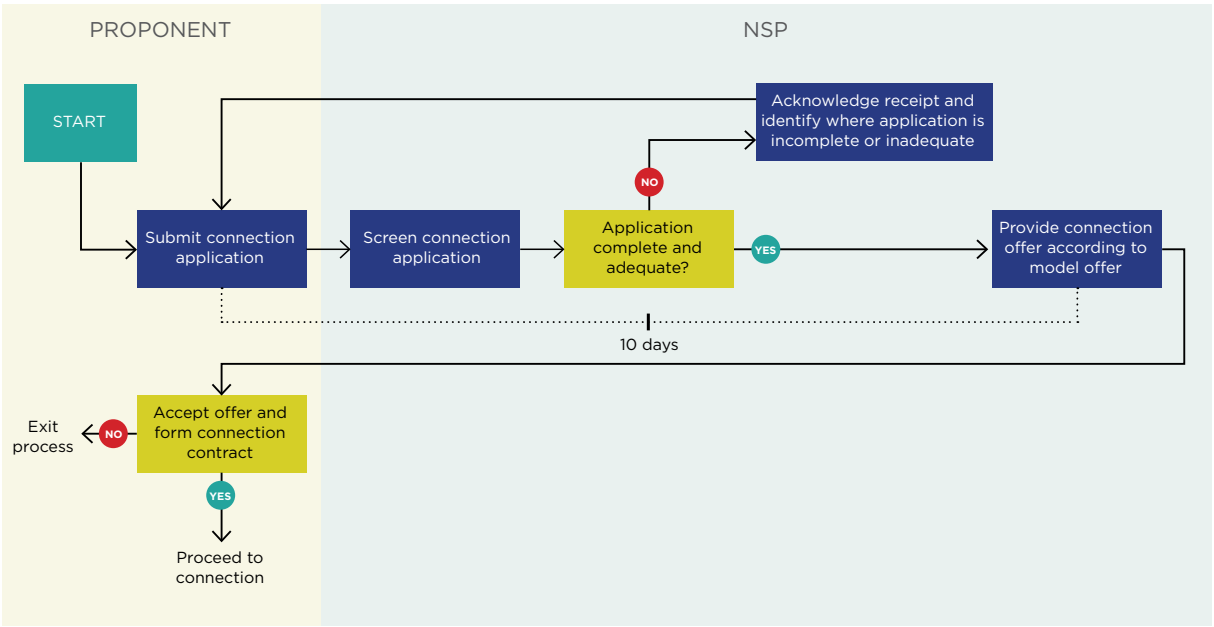
6 Except in WA where the process is outlined in the Access Code for Western Power. The WA requirements are less prescriptive than those provided for in the NER.

Figure 2 – Basic connections process



Note that the required timeframe for Western Australian networks to provide an initial response to a connection enquiry is 20 business days for connections within the SWIS. There is no minimum time requirement for the provision of an offer to connect.

Figure 3 – Standard connections process

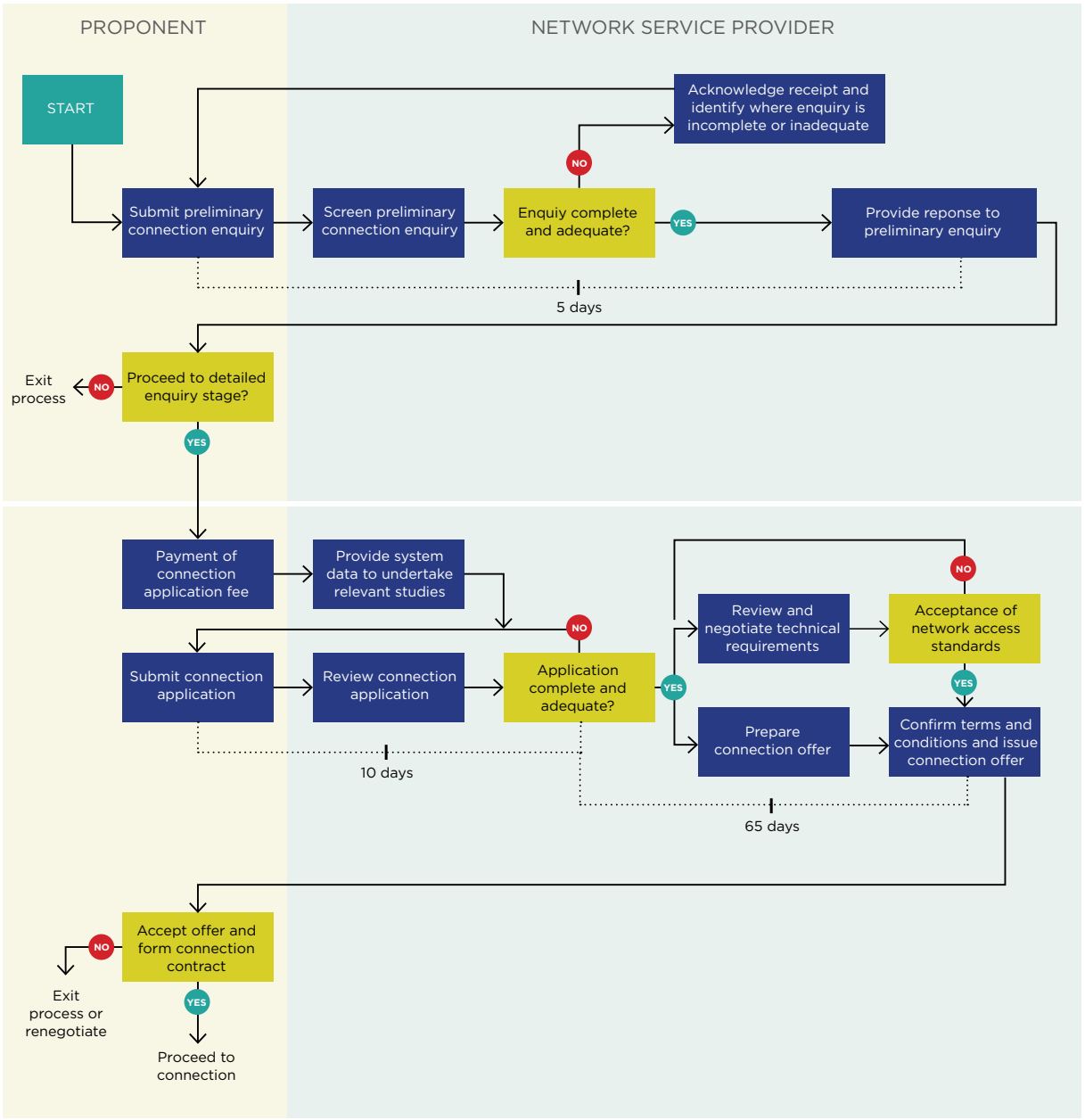


Note that the required timeframe for Western Australian networks to provide an initial response to a connection enquiry is 20 business days for connections within the SWIS. There is no minimum time requirement for the provision of an offer to connect.

4.3.2 Negotiated connection

The connection process for a negotiated connection to either low, medium or high voltage distribution networks is described in Chapter 5A, Part F, Division 2 of the National Electricity Rules, as summarised in Figure 4 below. Note that these connections may also choose to adopt the process for a registered generating unit (distribution networks) as described in Section 4.4.

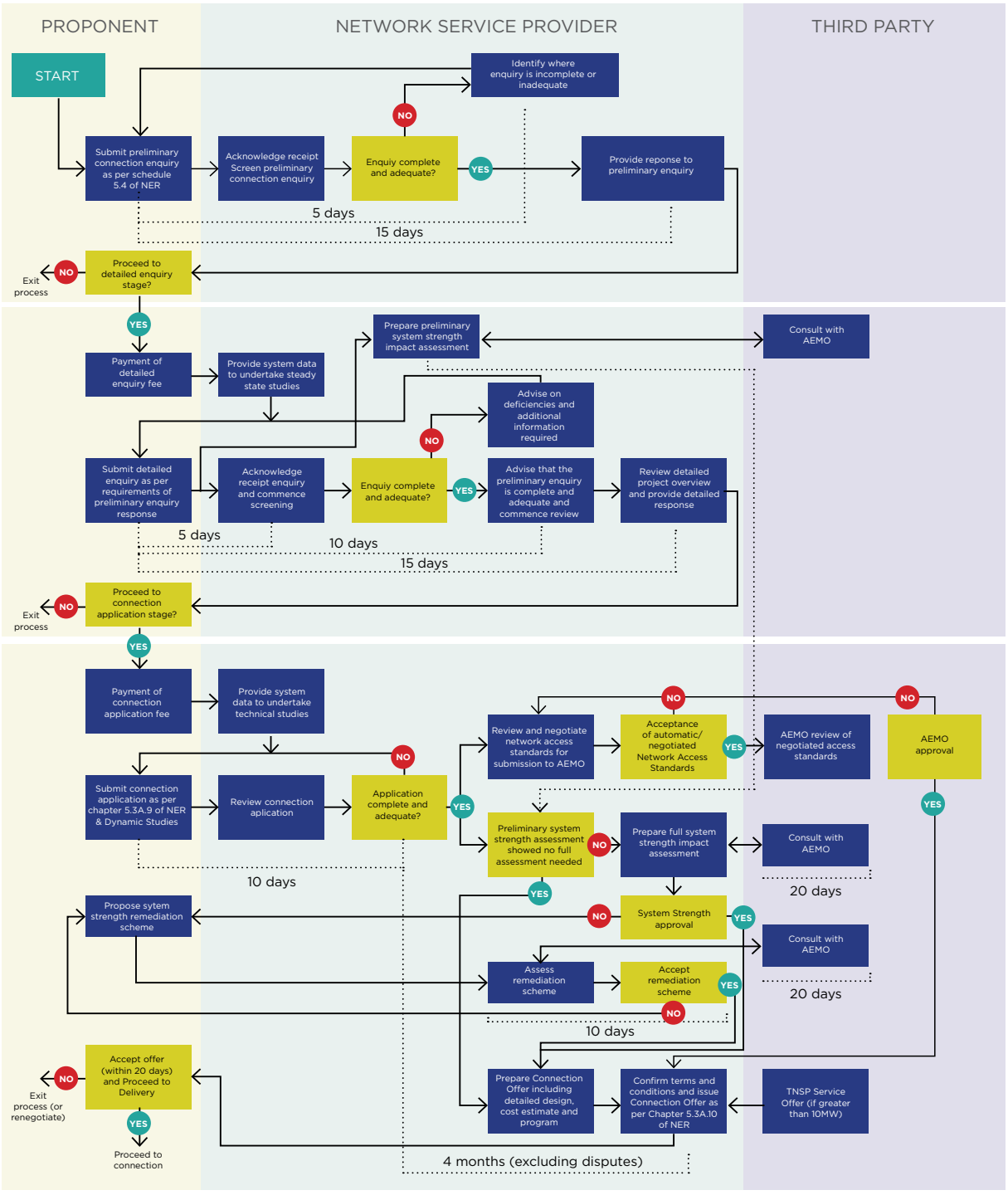
Figure 4 – Negotiated connections process



4.4 Registered generator connections (distribution connected)

The connection process for connecting a registered generating unit to distribution networks is described in Chapter 5.3A of the National Electricity Rules, as summarised in Figure 5 below.

Figure 5 – Registered generator connections process (distribution connected)

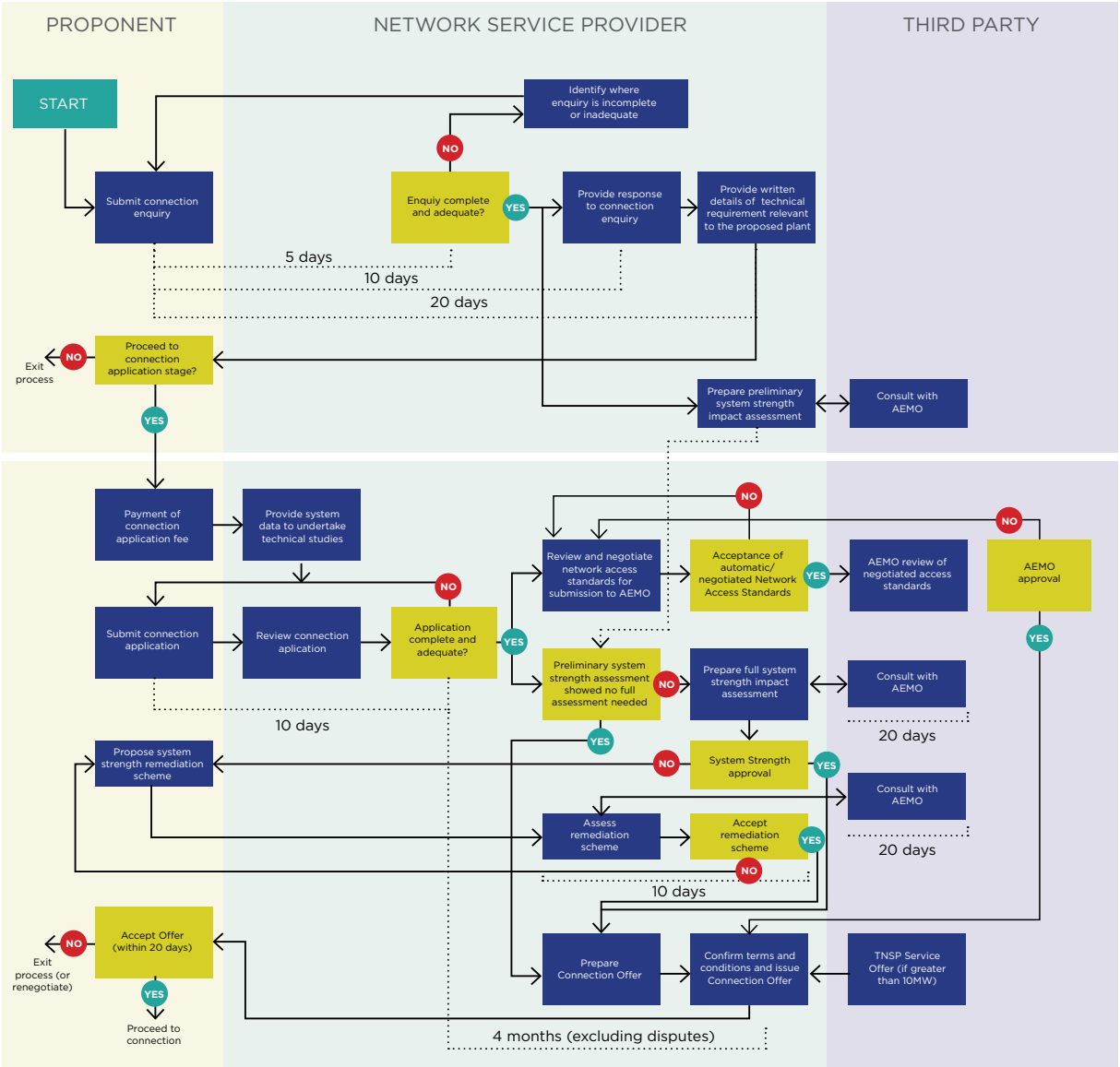


The process is not applicable for Western Australian NSPs.

4.5 Registered generator connections (transmission connected)

The connection process for Registered generator connections to transmission networks is described in Chapter 5.3 of the National Electricity Rules, as summarised in Figure 4 below.

Figure 6 – Registered generator connections process (transmission connected)



The process is not applicable for Western Australian NSPs.

4.6 Treatment of connection applications at the same network location (queuing policy)

At any given time, a NSP may be in receipt of multiple connection applications at the same location where the aggregate impact of the proposed generating systems exceeds network limitations at that connection point in terms of power transfer capability, fault levels and physical limitations. Where this occurs, NSPs shall adopt a practical approach to prioritising applications, without necessarily reserving or allocating the requested capacity for any one proponent, consistent with the open access regime under the National Electricity Rules[14].

4.6.1 Objectives of queuing policy

This queuing policy shall be developed with the objectives to give rise to economically efficient outcomes in terms of maximising the opportunity for all technically feasible and legitimate applications to proceed to connection.

The queuing policy shall avoid, to the extent possible, prioritising certain applications over others due to expected economic, market and/or network benefits to be provided by the connection in order to promote the open access regime under the National Electricity Rules.

4.6.2 Content of queuing policy

In their queuing policies, NSPs shall outline:

- At what point in its connection process, the proponent is allocated its place in the "queue"
- The mechanism for advising proponents of any limitations to their proposed connection based on applications by other proponent(s) ahead in the queue
- The options for proponents seeking to connect at a location with an existing queue, including, but not limited to:
  - Proceeding with the application and placed in the queue for the requested connection (with full knowledge of potential for limitations)
  - Proceeding with the application for a revised connection
  - Proceeding with the application for the requested connection and undertaking network augmentation to reduce the limitations (paid for proponent)
  - Exiting the process or identifying an alternative location
  - Accessing any "grouping" policies which enable proponents connecting at the same connection point to share the cost of network augmentation to reduce limitations
- Time limits on the proponents at various stages of the connection process, such that any proponent who exceeds these timeframes foregoes its place in the queue, and any reasonable grounds upon which time limits may be extended
- Any other conditions under which a proponent is required to forgo its place
- Any conditions where a proponent may be allowed to bypass other proponents in the queue.

Note, nothing in the above should be interpreted that a place in the queue confers a right upon a proponent to network capacity.

14 Note that there is legal requirement for Western Australian networks (Western Power but not all Horizon Power) to establish a queuing policy, such that NSPs must comply with the requirements in this part (plus additional requirements). NSPs within the NEM should comply. The open access regime also does not apply within Western Australia such that for Western Australian networks, queuing policy may have the intent to reserve or allocate capacity to proponents.

4.7 Connection charges

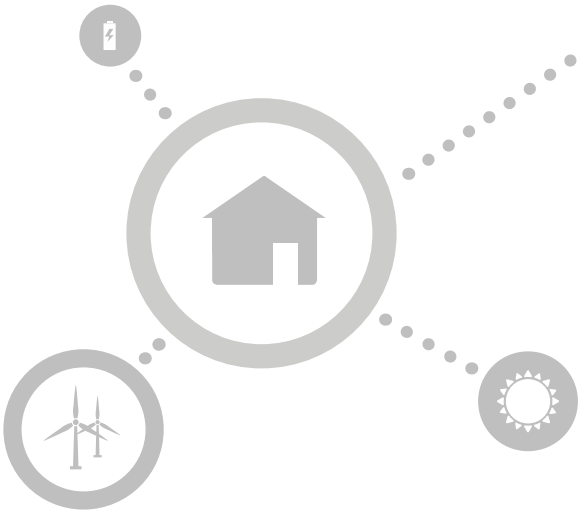
The connection charges, the applicable connection type and the basis for the charges are described in Table 4 for the National Electricity Market and in Table 5 for the Wholesale Electricity Market (WEM) for the South West Interconnected System of Western Australia (SWIS). The connection charges described are consistent with the National Electricity Rules and/or Western Australia Distribution Connections Manual and thus imposes no additional requirements on NSPs. NSPs shall detail how each of the connection charges is determined (with examples) within their own connection guidelines.

Table 4 – Connection charges in the NEM

Charge Type	Applicable Connection Types	Basis for Charge
Enquiry Fee	LV, MV, HV* Registered	To cover the reasonable costs of work required to prepare a detailed response to the enquiry *Only applies to connections under rule 5.3A
Connection Assessment Fee	LV, MV, HV* Registered	Fee to cover expenses directly and reasonably incurred by the DNSP in assessing the application and making a connection offer *Only applies to connections under chapter 5A of the NER
Application Fee	LV, MV, HV* Registered	To cover the reasonable costs of assessing the application to connect and making an offer to connect, including costs incurred by other NSPs and AEMO *Only applies to connections under rule 5.3A
Extension Capital Contribution	All	Fee for the cost of extending the network
Augmentation Capital Contribution	LV, MV, HV* Registered	Fee for the cost of augmenting the network if greater than the expected future revenue the DNSP will receive from the connection *Only applies for connections that exceed a threshold set in the DNSP's connection policy
Cost of Minor Deviations from Standard	Basic Micro EG Connection LV - Standard MV - Standard HV - Standard	Recovery of additional costs
Other Incidental Costs	Basic Micro EG Connection LV, MV, HV	Recovery of additional costs
Transmission Augmentation Costs	Registered Generator*	Costs to address fault levels, line reclosure protocols and stability aspects *Applies to generating units with a nameplate rating of 10MW or greater
Communications Costs	LV, MV, HV* Registered Generator	To cover the reasonable costs of remote control equipment and remote monitoring equipment as required by AEMO *Only applies to connections under rule 5.3A

Table 5 – Connection charges in the WEM (may not apply to Horizon Power)

Charge Type	Applicable Connection Types	Basis For Charge
Design Fee	All	Desktop estimate which does not generally include a site visit
Detailed Design Fee	All	Cost of preparing a detailed design of the connection
Access contract lodgement fee	Basic and standard	Application processing fee
Non-reference service application fee	Negotiated	Application processing fee
Capital Contribution	LV - Negotiated MV - Negotiated HV - Negotiated Registered Generator	Cost of augmenting the network less network access revenue that the network will collect from the customer



5. Technical requirements

NSPs shall produce separate technical guidelines for each of the connection types below which include the detailed technical requirements. NSPs may consider excluding a MV connection guideline where this is not applicable for their specific network characteristics.

The technical guidelines shall follow the structure as detailed below. The technical requirements which NSPs shall adopt are included in the detailed technical guidelines (to be published).

5.1 Basic micro EG connections

NSPs shall adopt the following framework for specifying the technical requirements for basic micro EG connections. The specific requirements to be adopted are outlined in the Basic micro EG Connection Technical Guidelines (*to be published*).

Section	Description of content
1. Introduction	Shall give an overview, provide a purpose, and define a scope. Shall include a decision tree to enable proponents to identify what type of connection is applicable and direct proponents to appropriate technical guideline
2. Definitions	Shall provide a list of the acronyms and abbreviations used in the document
3. General terms and conditions	Shall state the general requirements applicants need to meet before considering an application
3.1 Terminology	Shall outline how instructional terms are to be interpreted such as: *In this document, the word must indicates a mandatory requirement, the word should indicates a recommendation and the word may indicates a requirement that may be mandatorily imposed on the proponent, depending upon the outcome of technical studies*
4. Technical requirements	Shall outline that the technical requirements are mandatory in order to be classified as a basic micro EG connection and the options for proponents if they are unable to comply
4.1 Standards and codes	Shall provide a list of all the standards and codes to which all plant and equipment shall be designed, manufactured, installed and tested in accordance with
4.2 Labelling and signage	Shall indicate where and for what reasons labels and signs should/must be used on equipment components and on the installation
4.3 Maximum generation capacity	Shall state the maximum allowable capacity of the inverter energy system (30kVA or 10kVA per phase unless otherwise stated) and how the combined capacity of two inverter energy systems (e.g. battery and storage) at the same connection point are to be treated
4.4 Network connection and isolation	Shall provide information on the service protection device to be used and/or the outcomes to be achieved and the extent to which these are consistent with relevant Australian or International Standards
4.5 Earthing	Shall give details on the effective earthing system to be used and/or the outcomes to be achieved and the extent to which these are consistent with relevant Australian or International Standards
4.6 Protection	Shall detail the protection measures to be taken and/or the outcomes to be achieved and the extent to which these are consistent with relevant Australian or International Standards
4.7 Voltage	Shall specify limits to voltage rises and dips (maximum and minimum) from the connection point to the inverter and the extent to which these are consistent with relevant Australian or International Standards

Section	Description of content
4.8 Generation control	Shall specify how the generating unit should/must operate and describe those scenarios where output may need to be constrained (including but not limited to via export limitations)
4.9 Metering	Shall stipulate the metering standards that apply to the connection, how bi-directional power flow should/must be measured and registered, and whether changes are required to existing metering arrangements consistent with the National Electricity Rules and/or jurisdictional requirements Shall include requirements for net metering where applicable as per the relevant feed in tariff
4.10 Inverters	Shall provide information on the type of inverters allowed
4.11 Communications systems	Shall detail the requirements of communications systems that apply to the connection
4.12Communication and data protocols	Shall set out the requirements for transmitting data and information to and from the NSP and any other bodies
4.13 Cybersecurity	Shall set out the cybersecurity requirements including the safeguards and controls necessary to deter, detect, protect, respond to and recover from cybersecurity threats
5. Fees and charges	Shall specify whether connection application fees apply, the fees that may be applied and/or how the fees are determined. Shall describe any other service charges to effect the connection. Shall provide detail of any ongoing charges applicable regarding the installation and operation of the generating unit while maintaining the connection to the distribution network
6. Commissioning and testing	Shall state the requirements and responsibilities around testing the system to confirm compliance with the connection agreement including the intended design of all safety, protection, control, metering, monitoring systems associated with the IES, together with the electrical integrity of all primary circuit equipment
7. Operations and maintenance	Shall describe the responsibilities and practices around operating and maintaining the system
8. Related documents	Shall list and provide links to all relevant documents. Documents on legislation, standards, codes of practice, and network standards relative to the connection shall be listed
Appendix A: Connection arrangement requirements	Shall detail the requirements to the applicant around system diagrams and configuration
Appendix B: Model standing offer	Provides the AER approved (except WA) model standing offer for basic micro EG connection services

5.2 Low voltage connections

NSPs shall adopt the following framework for specifying the technical requirements for LV connections. The specific requirements to be adopted are outlined in the LV Technical Guidelines (*to be published*).

Section	Description of content
1. Introduction	Shall give an overview, provide a purpose, and define a scope Shall identify the number of standard connection types available Shall include a decision tree to enable proponents to identify what type of connection is applicable and direct proponents to the appropriate technical guideline
2. Definitions	Shall provide a list of the acronyms and abbreviations used in the document
2.1 Definitions	
2.2 Abbreviations	
2.3 Terminology	Shall outline how instructional terms are to be interpreted such as: *In this document, the word must indicates a mandatory requirement, the word should indicates a recommendation and the word may indicates a requirement that may be mandatorily imposed on the proponent, depending upon the outcome of technical studies*
3. Relevant rules and regulations	Shall list the rules and regulations, as well as standards and codes, that apply to the connection arrangement
4. Connection arrangements	Shall outline the connection arrangements for any standard and negotiated connection types and any export capacity restrictions on standard connection types and any general technical considerations
5. System requirements	Shall outline the connection arrangements for any standard and negotiated connection types on standard connection types and any general technical considerations
5.1 Labelling and signage	Shall indicate where and for what reasons labels and signs should/must be used on equipment components and on the installation
5.2 Generation control	Shall specify how generation should/must be constrained (including but not limited to via export limitations) for any standard and negotiated connection types
5.3 Fault levels and protection impacts	Shall outline the protection systems to be used to manage faults and abnormalities and any limits to fault contribution levels
5.4 Means of isolation	Shall state how the system is to be isolated (i.e. number of isolation points needed and locking requirements)
5.5 Operating voltage and frequency	Shall describe the standard power system voltage and frequency to which the generating unit should/must be designed and operate to, including how the generating unit should/must respond to disturbances
5.6 Inverter Energy Systems	Shall provide details on standards compliance, voltage limits for sustained operations, power quality modes, power limiting controls, and systems with multiple inverters
5.7 Non-IES	Shall provide details on standards compliance, re-energisation and synchronising, and power control
6. Protection	Shall detail the protection measures to be taken and/or the outcomes to be achieved and how these differ for each standard and negotiated connection type. Shall detail the extent to which these are consistent with relevant Australian or International Standards
6.1 IES protection	Shall detail specific protection measures to be taken by proponents for IES. Measures to be considered shall be, but are not limited to: loss of mains, voltage, frequency, power limits, and any other relevant IES protection settings (such as a grid protection relay device and wireless communication system)

Section	Description of content
6.2 Non-IES protection	Shall detail specific protection measures to be taken by proponents for non-IES. Measures to be considered shall be, but are not limited to: loss of mains, voltage, unbalance, frequency, a grid protection relay device, power limits, overcurrent, and anti-islanding
7. Earthing	Shall give details on the effective earthing system to be used and/or the outcomes to be achieved and how these differ for each standard and negotiated connection type Shall detail the extent to which these are consistent with relevant Australian or International Standards
8. Metering	Shall stipulate the metering standards that apply to the connection, how bi-directional power flow should/must be measured and registered, the supply options available for bulk metering, and whether changes are required to existing metering arrangements consistent with the National Electricity Rules and/or jurisdictional requirements Shall include requirements for net metering where applicable as per the relevant feed in tariff
9. Power quality	Shall describe the requirements around the connection point power factor, voltage changes and flicker, harmonic distortions with IES and non-IES, and voltage unbalance and how these differ for each standard and negotiated connection type Shall detail the extent to which these are consistent with relevant Australian or International Standards
10. Communications systems	Shall detail the requirements of communications systems for remote monitoring and control that apply to the connection
11. Communication and data protocols	Shall set out the requirements for transmitting data and information to and from the NSP and any other bodies
12. Cybersecurity	Shall set out the cybersecurity requirements including the safeguards and controls necessary to deter, detect, protect, respond to and recover from cybersecurity threats
13. Technical studies	Shall detail the requirements, scope and responsibilities for any technical studies which may be required to be completed by proponents and/or the NSP Shall detail the NSP acceptance criteria for any technical studies to be prepared by the proponent
14. Commissioning and testing	Shall state the requirements and responsibilities around testing the system to confirm compliance with the connection agreement including the intended design of all safety, protection, control, metering, monitoring systems associated with the IES, together with the electrical integrity of all primary circuit equipment and how these differ for each standard and negotiated connection type.
15. Operations and maintenance	Shall describe the responsibilities and practices around operating and maintaining the system and how these differ for each standard and negotiated connection type
16. Related documents	Shall list and provide links to all relevant documents. Documents on legislation, standards, codes of practice, and network standards relative to the connection shall be listed
Appendix A: Connection arrangement requirements	Shall detail the requirements to the applicant around system diagrams and configuration
Appendix B: Model standing offer(s)	Provides the AER approved (except WA) model standing offer for any standard connections

5.3 Medium voltage connections

NSPs shall adopt the following framework for specifying the technical requirements for MV connections. The specific requirements to be adopted are outlined in the MV Technical Guidelines (*to be published*). Note that the structure is identical to the LV and HV framework but is provided here for completeness.

Section	Description of content
1. Introduction	Shall give an overview, provide a purpose, and define a scope Shall identify the number of standard connection types available Shall include a decision tree to enable proponents to identify what type of connection is applicable and direct proponents to appropriate technical guideline
2. Definitions	Shall provide a list of the acronyms and abbreviations used in the document
2.1 Definitions	
2.2 Abbreviations	
2.3 Terminology	Shall outline how instructional terms are to be interpreted such as: *In this document, the word must indicates a mandatory requirement, the word should indicates a recommendation and the word may indicates a requirement that may be mandatorily imposed on the proponent, depending upon the outcome of technical studies*
3. Relevant rules and regulations	Shall list the rules and regulations, as well as standards and codes, that apply to the connection arrangement
4. Connection arrangements	Shall outline the connection arrangements for any standard and negotiated connection types and any generation control (including export limitations) on standard connection types and any general technical considerations
5. System requirements	Shall detail the distribution network's performance requirements as well as the specific requirements for the generating unit and the installation and how these differ for each standard and negotiated connection type
5.1 Labelling and signage	Shall indicate where and for what reasons labels and signs should/must be used on equipment components and on the installation
5.2 Generation control	Shall specify how generation should/must be constrained (including but not limited to via export limitations) for any standard and negotiated connection types
5.3 Fault levels and protection impacts	Shall outline the protection systems to be used to manage faults and abnormalities and any limits to fault contribution levels
5.4 Means of isolation	Shall state how the system is to be isolated (i.e. number of isolation points needed and locking requirements)
5.5 Operating voltage and frequency	Shall describe the standard power system voltage and frequency to which the generating unit should/must be designed and operate to including how the generating unit should/must respond to disturbances
5.6 Inverter Energy Systems	Shall provide details on standards compliance, voltage limits for sustained operations, power quality modes, power limiting controls, and systems with multiple inverters
5.7 Non-inverter energy systems	Shall provide details on standards compliance, re-energisation and synchronising, and power control
6. Protection	Shall detail the protection measures to be taken and/or the outcomes to be achieved and how these differ for each standard and negotiated connection type. Shall detail the extent to which these are consistent with relevant Australian or International Standards
6.1 IES protection	Shall detail specific protection measures to be taken by proponents for IES. Measures to be considered shall be, but are not limited to: loss of mains, voltage, frequency, power limits, and any other relevant IES protection settings (such as a grid protection relay device and wireless communication system)

Section	Description of content
6.2 Non IES protection	Shall detail specific protection measures to be taken by proponents for non IES. Measures to be considered shall be, but are not limited to: loss of mains, voltage, unbalance, frequency, a grid protection relay device, power limits, overcurrent, and anti-islanding
7. Earthing	Shall give details on the effective earthing system to be used and/or the outcomes to be achieved and how these differ for each standard and negotiated connection type Shall detail the extent to which these are consistent with relevant Australian or International Standards
8. Metering	Shall stipulate the metering standards that apply to the connection, how bi-directional power flow should/must be measured and registered, and whether changes are required to existing metering arrangements consistent with the National Electricity Rules and/or jurisdictional requirements Shall include requirements for net metering where applicable as per the relevant feed in tariff
9. Power quality	Shall describe the requirements around the connection point power factor, voltage changes and flicker, harmonic distortions with IES and non-IES, and voltage unbalance and how these differ for each standard and negotiated connection type. Shall detail the extent to which these are consistent with relevant Australian or International Standards
10. Communications systems	Shall detail the requirements of communications systems for remote monitoring and control that apply to the connection
11. Communication and data protocols	Shall set out the requirements for transmitting data and information to and from the NSP and any other bodies
12. Cybersecurity	Shall set out the cybersecurity requirements including the safeguards and controls necessary to deter, detect, protect, respond to and recover from cybersecurity threats
13. Technical studies	Shall detail the requirements, scope and responsibilities for any technical studies which may be required to be completed by proponents and/or the NSP Shall detail the NSP acceptance criteria for any technical studies to be prepared by the proponent
14. Commissioning and testing	Shall state the requirements and responsibilities around testing the system to confirm compliance with the connection agreement including the intended design of all safety, protection, control, metering, monitoring systems associated with the IES, together with the electrical integrity of all primary circuit equipment and how these differ for each standard and negotiated connection type
15. Operations and maintenance	Shall describe the responsibilities and practices around operating and maintaining the system and how these differ for each standard and negotiated connection type
16. Related documents	Shall list and provide links to all relevant documents. Documents on legislation, standards, codes of practice, and network standards relative to the connection shall be listed
Appendix A: Connection arrangement requirements	Shall detail the requirements to the applicant around system diagrams and configuration
Appendix B: Model standing offer(s)	Provides the AER approved (except WA) model standing offer for any standard connections

5.4 High voltage connections

NSPs shall adopt the following framework for specifying the technical requirements for HV connections. The specific requirements to be adopted are outlined in the HV Technical Guidelines (*to be published*). Note that the structure is identical to the LV and MV framework but is provided here for completeness.

Section	Description of content
1. Introduction	Shall give an overview, provide a purpose, and define a scope Shall identify the number of standard connection types available Shall include a decision tree to enable proponents to identify what type of connection is applicable and direct proponents to appropriate technical guideline
2. Definitions	Shall provide a list of the acronyms and abbreviations used in the document.
2.1 Definitions	
2.2 Abbreviations	
2.3 Terminology	Shall outline how instructional terms are to be interpreted such as: *In this document, the word must indicates a mandatory requirement, the word should indicates a recommendation and the word may indicates a requirement that may be mandatorily imposed on the proponent, depending upon the outcome of technical studies.*
3. Relevant rules and regulations	Shall list the rules and regulations, as well as standards and codes that apply to the connection arrangement
4. Connection arrangements	Shall outline the connection arrangements for any standard and negotiated connection types and any generation control (including export limitations) on standard connection types and any general technical considerations
5. System requirements	Shall detail the distribution network's performance requirements as well as the specific requirements for the generating unit and the installation and how these differ for each standard and negotiated connection type
5.1 Labelling and signage	Shall indicate where and for what reasons labels and signs should/must be used on equipment components and on the installation
5.2 Generation control	Shall specify how generation should/must be constrained (including but not limited to via export limitations) for any standard and negotiated connection types
5.3 Fault levels and protection impacts	Shall outline the protection systems to be used to manage faults and abnormalities and any limits to fault contribution levels
5.4 Means of isolation	Shall state how the system is to be isolated (i.e. number of isolation points needed and locking requirements)
5.5 Operating voltage and frequency	Shall describe the standard power system voltage and frequency to which the generating unit should/must be designed and operate to including how the generating unit should/must respond to disturbances
5.6 Inverter Energy Systems	Shall provide details on standards compliance, voltage limits for sustained operations, power quality modes, power limiting controls, and systems with multiple inverters
5.7 Non inverter systems	Shall provide details on standards compliance, re-energisation and synchronising, and power control
6. Protection	Shall detail the protection measures to be taken and/or the outcomes to be achieved and how these differ for each standard and negotiated connection typeShall detail the extent to which these are consistent with relevant Australian or International Standards
6.1 IES protection	Shall detail specific protection measures to be taken by proponents for IES. Measures to be considered shall be, but are not limited to: loss of mains, voltage, frequency, power limits, and any other relevant IES protection settings (such as a grid protection relay device and wireless communication system)

Section	Description of content
6.2 Non IES protection	Shall detail specific protection measures to be taken by proponents for non IES. Measures to be considered shall be, but are not limited to: loss of mains, voltage, unbalance, frequency, a grid protection relay device, power limits, overcurrent, and anti-islanding
7. Earthing	Shall give details on the effective earthing system to be used and/or the outcomes to be achieved and how these differ for each standard and negotiated connection type. Shall detail the extent to which these are consistent with relevant Australian or International Standards
8. Metering	Shall stipulate the metering standards that apply to the connection, how bi-directional power flow should/must be measured and registered, the supply options available for bulk metering, and whether changes are required to existing metering arrangements consistent with the National Electricity Rules and/or jurisdiction requirements Shall include requirements for net metering where applicable as per the relevant feed in tariff
9. Power quality	Shall describe the requirements around the connection point power factor, voltage changes and flicker, harmonic distortions with IES and non-IES, and voltage unbalance and how these differ for each standard and negotiated connection type. Shall detail the extent to which these are consistent with relevant Australian or International Standards
10. Communications systems	Shall detail the requirements of communications systems for remote monitoring and control that apply to the connection
11. Communication and data protocols	Shall set out the requirements for transmitting data and information to and from the NSP and any other bodies
12. Cybersecurity	Shall set out the cybersecurity requirements including the safeguards and controls necessary to deter, detect, protect, respond to and recover from cybersecurity threats
13. Technical studies	Shall detail the requirements, scope and responsibilities for any technical studies which may be required to be completed by proponents and/or the NSP Shall detail the NSP acceptance criteria for any technical studies to be prepared by the proponent
14. Commissioning and testing	Shall state the requirements and responsibilities around testing the system to confirm compliance with the connection agreement including the intended design of all safety, protection, control, metering, monitoring systems associated with the IES, together with the electrical integrity of all primary circuit equipment how these differ for each standard and negotiated connection type
15. Operations and maintenance	Shall describe the responsibilities and practices around operating and maintaining the system how these differ for each standard and negotiated connection type
16. Related documents	Shall list and provide links to all relevant documents. Documents on legislation, standards, codes of practice, and network standards relative to the connection shall be listed
Appendix A: Connection arrangement requirements	Shall detail the requirements to the applicant around system diagrams and configuration
Appendix B: Model standing offer(s)	Provides the AER approved (except WA) model standing offer for any standard connections

6. Document management

6.1 Reviews

6.1.1 Review Frequency

The guidelines shall be reviewed, whichever is sooner:

- Two years after the most recent review of the guidelines:
- When it is identified that changes in legislation or regulation mean that these guidelines are no longer consistent with legal frameworks (*the legal trigger*)
- When it is identified that changes in generation and/or network technology or technical standards mean that certain technical requirements are no longer fit for purpose (*the technology trigger*).

The initial review shall be undertaken within 6 months from publication.

Any party may request to Energy Networks Australia that an early review is undertaken, but the final decision as to whether the review is triggered shall be made by Energy Networks Australia.

6.1.2 Review process

The review of the guidelines is the responsibility of Energy Networks Australia with oversight by the Asset Management Committee (AMC) comprised of Energy Networks Australia and its representative from each of its member organisations.

During the review process Energy Networks shall identify potential amendments which, in the view of the Energy Networks AMC, either:

- Better achieve the objectives as set out in Section 1.1 of this document, and/or
- Respond to any legal or technology triggers identified.

Any proposed changes shall be required to be reviewed by key stakeholders including:

- The Australian Energy Market Operator
- The Clean Energy Council
- The Australian Energy Regulator
- The Australian Energy Market Commission
- Energy Consumers Australia
- Any other stakeholders identified by Energy Networks Australia at the time of the review.

Stakeholders shall be asked to comment on the amendments proposed and/or propose additional or alternative amendments. The final decision on amendments to be adopted shall be made by Energy Networks Australia and an amended version (highlighting the amendments made) published on the Energy Networks Australia website.

6.2 Evaluation

The guidelines shall be evaluated via a full independent evaluation every two years, complemented by an annual scan of legislation, regulation and technical standards.

6.2.1 Independent Evaluation

Energy Networks Australia shall commission an independent evaluation of the guidelines every two years, at least three months prior to each review. The purpose of the independent evaluation is to identify the extent to which the guidelines are achieving the objectives set out in Section 1.1 of this document. Specifically, the evaluation shall identify:

- The extent to which NSPs are deemed to have complied with the guidelines in terms of:
  - Connection types
  - Structure of documentation of technical requirements
  - The technical requirements themselves
- The reasons for any NSP non-compliances
- Proponents' views on the extent to which NSPs' technical requirements are:
  - Clear
  - Consistent
  - Avoid unnecessarily onerous requirements
- Any changes in legislation which may invoke a legal trigger for review
- Any changes in technology, including changes in relevant Australian and International Standards, which may invoke a technology trigger for review.

The evaluation shall then make recommendations as to possible changes. The findings of the evaluation shall be discussed with NSPs (especially where they relate to non-compliances) with high level findings (at the aggregate level) made available on the Energy Networks Australia website.

6.2.2 Internal scan

In addition to the evaluation, Energy Networks Australia shall also conduct an internal scan of legislation, regulation and technical standards on an annual basis. The objective of the can is to identify whether there is a need for either a legal or technical trigger for earlier review of the guidelines. The high level findings (at the aggregate level) made available on the Energy Networks Australia website.

Notes

Energy Networks Australia