



Large Customer Connection Manual



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1. FOREWORD

The Australian Energy Regulator (AER) identified that there is potential for competition in design and construction of large Connection Assets; and as Connection Asset costs can be directly attributed to a Connection Applicant, design and construction of large connection assets is determined to be an Alternative Control Service. Connection Assets are those “dedicated” high voltage and low voltage assets required to connect a Connection Applicant’s electrical installation to the Network.

This change in service classification means that Large Connection Applicants shall pay the cost of design and construction of new Connection Assets required to supply the Connection Applicant.

Connection Applicants may choose Service Providers (SP) rather than the Energex to design and construct the Connection Assets in accordance with Energex standards. This generally includes electrical equipment within the geographical boundary of the Connection Applicant’s site and any external infrastructure that is identified as a Connection Asset used to connect the Connection Applicant to the network.

On completion of construction, Connection Assets may then be gifted to Energex. Gifted assets shall be owned, operated and maintained by Energex.

Connection Applicants may choose not to gift assets to Energex. In this case the Connection Applicant will be required to design, construct, operate and maintain their electricity supply in accordance with legislative and National Electricity Rules (NER) requirements.

2. PURPOSE AND SCOPE

This Manual explains the process that a Connection Applicant shall follow to obtain connection to the network for a new project or an increase in supply capacity to an existing installation. It also provides the process and framework to be followed by Service Providers who may undertake the design and construction of Connection Assets on behalf of a Connection Applicant.

The requirements of this Manual apply to all requests from Large Connection Applicants for new connections or increase in supply capacity.

A Large Customer is defined as a Connection Applicant with:

- An estimated annual electricity consumption greater than 4GWh per annum, or
- An estimated maximum demand greater than 1MVA, or
- Significant connection assets, or
- A generating system with nameplate capacity greater than 30 kVA.

Large Customers are also defined as either Individually Calculated Customers (ICC) or Connection Asset Customers (CAC) in accordance with the definitions in Energex Network Pricing Principles Statement.

This Manual does not apply to:

- The construction of subdivisions that are reticulated in accordance with the Energex Subdivision Standards – Developer Design and Construct Estates
- The design, supply and installation of HV reticulation that is owned by a Connection Applicant. Energex may require the owner of this installation to contribute financially to the installation or upgrade of any Energex network used to supply the installation
- Low voltage equipment owned by the Connection Applicant
- The relocation of existing assets on a “like for like” basis.

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3. DEFINITIONS, ABBREVIATIONS AND ACRONYMS

Definitions, abbreviations and acronyms used in the NER have the same meaning when used in this document. In the case where there may appear to be a conflict between definitions or information contained in this manual and the NER, the requirements of the NER will apply.

Additional definitions may be obtained from Chapter 10 of the NER.

AEMO	Australian Energy Market Organisation
AEMC	Australian Energy Market Commission
Australian Energy Regulator (AER)	A Federal Government body responsible for the economic regulation of electricity distribution services in the National Electricity Market.
Compliant Connection Enquiry	A connection enquiry that contains all the relevant information required by Energex.
Connection Applicant	A person who wants to establish or modify connection to a transmission network or distribution network and/or who wishes to receive network services and who makes a connection enquiry as described in NER clause 5.3.2.
Connection Asset	Those components of a transmission or distribution system which are used to provide connection services.
Connection Point	The agreed point of supply established between Network Service Provider(s) and another Registered Participant, Non-Registered Connection Applicant or franchise Connection Applicant.
Contestable	<p>(a) In relation to transmission services, a service which is permitted by the laws of the relevant participating jurisdiction to be provided by more than one Transmission Network Service Provider as a contestable service or on a competitive basis.</p> <p>(b) In relation to distribution services, a service which is permitted by the laws of the relevant participating jurisdiction to be provided by more than one Energex as a contestable service or on a competitive basis.</p>
Contributed Asset	Assets are that funded by a Connection Applicant. Typically these will be Connection Assets. Contributed assets are not recorded in Energex Regulatory Asset Base or are recorded as zero value for the purpose of future determinations by the AER
Customer	<p>A person who:</p> <p>(a) engages in the activity of purchasing electricity supplied through a transmission or distribution system to a connection point; and</p> <p>(b) is registered by AEMO as a Customer under Chapter 2. (of the NER).</p>
Customer Asset	HV reticulation assets that are owned by the customer and are designed and constructed in accordance with AS/NZS 3000.
Energex	The electricity distribution authority responsible for the distribution of electricity to the Connection Applicant.

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Distribution System	A distribution network, together with the connection assets associated with the distribution network which is another transmission or distribution system.
HV	High Voltage nominally above 1kV.
Large Customer Connection	<p>A large customer connection is identified as having:</p> <ul style="list-style-type: none">• an estimated annual electricity consumption greater than 4GWh per annum, or• an estimated maximum demand greater than 1MVA, or• significant connection assets, or• a generating system with nameplate capacity greater than 30kVA. <p>This definition complies with Australian Energy Regulator's decision on classification of services outlined in "Final Decision - Framework and Approach Paper - Classification of Services and Control Mechanisms - 2010–15 (August 2008)"</p>
Low Voltage Connection Point	The low voltage terminals of the distribution transformer. Energex is responsible for the operation and maintenance of the transformer and other HV equipment and the Connection Applicant is responsible for the installation, operation and maintenance of the all low voltage equipment.
National Electricity Rules (NER)	The National Electricity Rules govern the operation of the National Electricity Market.
National Metering Identifier (NMI)	A National Metering Identifier as described in NER clause 7.3.1(d).
Network	The apparatus, equipment, plant and buildings used to convey, and control the conveyance of, electricity to customers (whether wholesale or retail) excluding any connection assets. In relation to a Network Service Provider, a network owned, operated or controlled by that Network Service Provider. (Often referred to as "Shared Network").
Network Coupling Point	The point at which connection assets join a distribution network, used to identify the distribution service price payable by a Connection Applicant.
Network Augmentation Works	Augmentation works required on network assets to enable a new project to be supplied or the increase in supply for an existing Connection Applicant.
Registered Participant	A person who is registered by AEMO in any one or more of the categories listed in clauses 2.2 to 2.7 [of the NER] (in the case of a person who is registered by AEMO as a Trader, such a person is only a Registered Participant for the purposes referred to in clause 2.5A [of the NER]). However, as set out in clause 8.2.1(a1)[of the NER], for the purposes of some provisions of clause 8.2 [of the NER] only, AEMO and Connection Applicants who are not otherwise Registered Participants are also deemed to be Registered Participants.
Service Provider (SP)	A person or organisation authorised by Energex to carry out design and/or construction of certain electrical works.

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4. REFERENCES

4.1. Energex

Copies of Energex Standards may be obtained from the Energex website

4.2. Referenced Documents:

- National Electricity Rules
- Queensland Electricity Connection and Metering Manual
- ENA Guideline for the preparation of documentation for connection of Embedded Generation within Distribution Networks
- Energex Customer Standard for Small to Medium Scale Embedded Generation (RED 657)
- Relevant Acts, Regulations and Codes of Practice in Queensland

4.3. Referenced Standards and Guidelines

Additional Australian Standards are listed in Energex standard design documents.

AS 2067	Substations and high voltage installations exceeding 1 kV ac
EG1	ESAA Substation Earthing Guide
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 61000 Series	Electromagnetic compatibility (EMC)
AS/NZS 7000	Overhead line design standard

4.4. Planning and Environmental Laws

The Connection Applicant is responsible for obtaining all licences, permits, agreements and approvals required under planning, environmental and cultural heritage laws which relate to the construction of any works to be carried out by or on behalf of the Connection Applicant.

There are a number of different planning, environmental and cultural heritage laws which may relate to the proposed connection. Some of the principal legislation includes but not limited to the following:

(a) *Sustainable Planning Act 2009 (Qld)*

The *Sustainable Planning Act 2009 (Qld)* integrates a great number of approvals processes under other legislation including, for example, the *Vegetation Management Act 1999*. These "integrated" Acts may relate to the proposed connection as well.

(b) *Environmental Protection Act 1994 (Qld)*

(c) *Environmental Protection and Biodiversity Conservation Act 1999 (Cth)*.

This Act regulates actions having a significant impact on world heritage, Ramsar wetlands, threatened species and communities, migratory species, and many other things.

(d) *Aboriginal Cultural Heritage Act 2003 (Qld)* and *Torres Strait Islander Cultural Heritage Act 2003 (Qld)*.

These laws make it illegal to harm, excavate, relocate, take away or be in possession of Indigenous cultural heritage.

(e) *Queensland Heritage Act 1992*

(f) *Nature Conservation Act 2002*

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It is the responsibility of The applicant to comply with relevant legislation.

5. NETWORK CONNECTION PRINCIPLES

Network Connection Assets for Large Connection Applicants

The Connection Applicant is required to fund all new Connection Assets necessary to facilitate the connection of the Connection Applicant's electrical installation to Energex Network. In general, the design and construction of Connection Assets is contestable. However, Energex will undertake a risk assessment of the proposal and shall determine at its absolute discretion if the work is performed by Energex or an accredited service provider.

The Network Coupling Point defines the boundary between the Network and Connection Asset and identifies the ownership responsibility between Energex and the Connection Applicant.

Where Connection Assets include transformers, the Network Connection Point and low voltage metering will normally be on the low voltage side of the transformer. HV metering will be installed in situations where the customer owns and operates the HV assets.

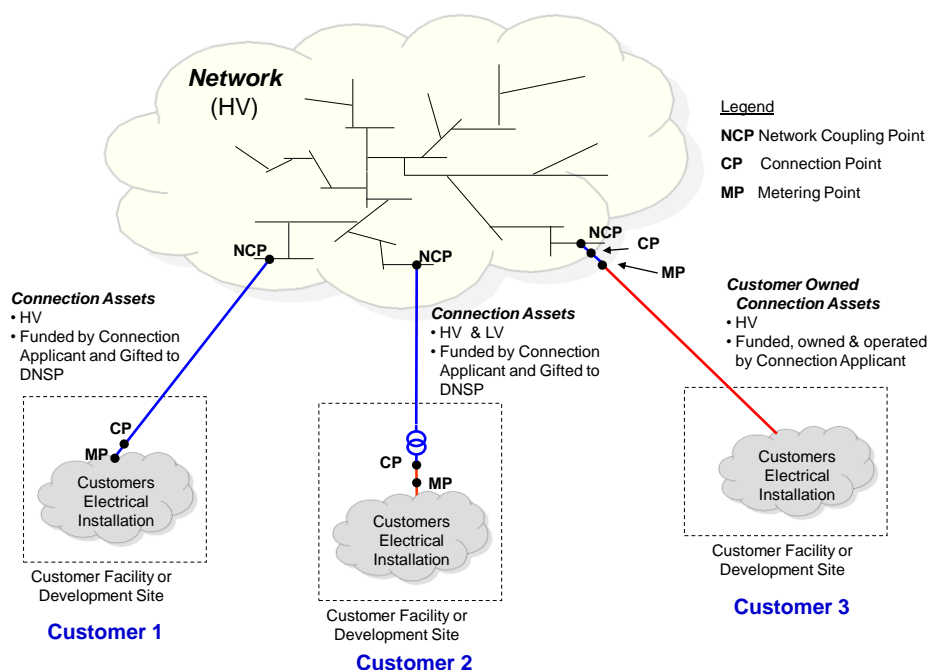


Figure 1: Asset Boundary Principles

Energex may also need to upgrade or augment the network to provide adequate capacity for connection of the Connection Applicant. When determining whether a required section of network is Shared Network or Connection Asset, Energex will consider a planning horizon giving consideration to the potential for other developments in the area. Energex Capital Contribution Policy and Network Pricing Principles Statement will apply with respect to augmentation of Shared Network associated with the new connection. These policies are available from Energex by contacting the representative listed in Section 13.

5.2.1 Distinguishing Contestable and Non-contestable Connection Assets

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- (a) For **existing substations and substation yards** into which Connection Assets are to be installed, the following shall apply:
- A case-by-case risk assessment – which may be based on a standard-form risk assessment relating to third parties entering and working in substations - will be undertaken by Energex to evaluate the level of risk that would arise, whether that risk can be managed and (if so) what sort of measures are required. There may be situations in which the risks to Energex's Network cannot be adequately mitigated.
 - In the event of an un-mitigatable high risk, Energex will either:
 - Design and construct all of the Connection Assets that will be paid for by the Customer; or
 - Alternatively will split the Connection Assets such that Energex will undertake the design and construction where necessary and allow the Customer to design and construct other assets to the extent this is possible. For example, if the risks to the Network do not permit a Customer to design and construct an asset within a substation, Energex may design and construct assets within the substation and provide a structure / point outside the substation from which the balance of the connection assets can be designed and constructed by the Customer;
 - The Customer may elect to design and construct any Connection Assets that the risk assessment determines and then gift the assets to Energex.
- (b) **Protection systems** are considered part of the Connection Assets. Dedicated protection systems will be funded by Large Customers as part of the LCC design and construct service.
- (c) **Bus creations and extensions** in a shared substation – while the need to construct or augment a bus may result from the new Large Customer's Connection requirements:
- a New Bus will, by definition, be shared with others; and
 - an Existing Bus is, by definition already a Shared Asset.
- (d) **Feeder Bays** in existing substations that are required to connect to new LCCs' dedicated feeders are to be paid for by the Large Customers, including the costs of the secondary protection and communications systems that are required to protect the Connection Assets to the Large Customers.
- As set out in "**existing substations and substation yards**" above – a risk assessment shall determine whether (or not) Large Customers can undertake these works.
- (e) **Re-configuration of existing feeder bays** to accommodate new LCCs' Connections will normally be non-contestable as an existing feeder bay will normally be a shared asset. Where an existing feeder bay is defined in the Network Management Plan as being required within the next 5 years, then the feeder bay cannot be made available for the customer connection.
- (f) **Metering** is subject to specific regulatory requirements. If a Type 1-4 Metering Installation is required, the metering is unregulated and contestable.
- (g) **Augmentation of upstream Shared Network** assets such as feeders, transformers or substations is Energex's responsibility as the DNSP, and these works are not contestable.
- (h) **Re-arrangement of network** shall be funded by the Applicant.
- (i) **Communications networks** established for the protection of the Connection Assets and/or SCADA requirements of the Large Customer's installation are considered part of

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the Connection Assets. Dedicated communications networks will be funded by Large Customers as part of the LCC design and construct service.

5.2.2 Contribution to Augmentation of Shared Network Assets

Energex will assess on a case by case basis whether the Large Customer is required to contribute towards the cost of the shared network augmentation taking into consideration both economic and commercial factors and whether the increased network capacity provided by the augmentation will be for the benefit the new connection applicant. For further information, the applicant is directed to Energex's approved Annual Pricing Proposal on the AER website and Capital Contributions Policy on the Energex website.

5.1. Distribution Network and Connection Asset Boundaries

Energex shall be responsible for determining the Network Coupling Point between existing or proposed Network and the new Connection Assets required to connect a Connection Applicant's electrical installation or development. Guidelines are provided in Table 1 below.

Examples of the application of these principles are provided in Annex A.

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Asset Category	Works to supply Connection Applicant	Service Classification (Note 1)	Option for Works by Connection Applicant
Bulk Supply or Zone Substation (33kV to 132kV)	New assets or augmentation of existing assets e.g. switchgear, transformers.	Network Assets	No
HV Feeders or sections of HV feeder (11kV to 132kV)	<p>New feeder or augmentation of existing feeder where feeder is expected to supply customers other than the Connection Applicant within a 7 year planning horizon.</p> <p>Examples:</p> <p>(i) HV feeder will form part of the Network supplying other customers.</p> <p>(ii) Overhead construction with multiple circuits where at least one circuit is supplying other customers.</p> <p>(iii) Underground construction with multiple conduits or circuits where at least one circuit supplying other customers.</p>	Network Assets	No
	New feeder or section of feeder is dedicated to connecting the Connection Applicants only and unlikely to be used within a 7 year planning horizon as network supplying other customers.	Connection Assets	Yes
Distribution Substations on Connection Applicants Premises or Development Site (Note 2) (LV, 11kV or 22kV)	Transformers and LV switchgear supplying Connection Applicant's facilities at the site only.	Connection Assets	Yes
	<p>HV cables and HV switchgear at the site where connection arrangement involves:</p> <p>(a) A single "loop in / loop out" HV cable connection to the network, and</p> <p>(b) No protection relay controlled HV network switchgear is involved.</p> <p>Refer Annex A - Examples 1, 2 & 4</p>	Connection Assets	Yes
	<p>HV Cables and HV switchgear at the site where connection arrangement involves more than a single "loop in / loop out" connection to the network.</p> <p>Refer Annex A - Example 3</p>	Network Assets	No
	<p>Protection relay controlled HV network switchgear.</p> <p>Refer Annex A - Example 5</p>	Network Assets	No

Table 1: Guidelines for Determining Network and Connection Assets

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Note 1. Service Classification:

- Connection Assets - Alternate Control Service applies i.e. works to be funded by Connection Applicant up front
- Network Assets - Standard Control Service applies – works will be funded via ongoing network or tariff charges but may be subject to a capital contribution (refer section 5.2.2).

Note 2. A development site may comprise one or more Registered Property Lots.

5.2. Developments involving Multiple Connection Points or NMI's

Generally, a large customer will be a single entity and the connection point will be allocated one National Metering Identifier (NMI). In certain situations e.g. shopping centre, mixed commercial / residential building development, the primary large customer or developer may provide access to the initial connection point for unit owners or tenants, and additional NMI's will be created as a result for connection. In some situations there could be both large customers and small customers serviced from the Connection Assets at the same site or customer substation. However the Rules provide for a connection service to serve a single customer or group of customers. These types of developments will be considered as large connections if the definition criteria are met based on the whole development site, irrespective of future metering point or NMI arrangements involving multiple customers being served from within the development.

5.3. Asset Ownership

The Connection Applicant has the option of either gifting the installed Connection Asset to Energex or owning the asset. A Connection Asset that is gifted to Energex shall be designed and constructed to Energex standards and shall be operated and maintained by Energex. Energex shall become the asset owner from the date of issuing the Certificate of Acceptance unless otherwise agreed.

The agreement as to whether the Connection Asset will be gifted or owned shall be made prior to submitting the Connection Application and details shall be included in the Offer to Connect.

Design and construction of Network Assets shall be completed by Energex.

If the Connection Applicant decides to own, operate, and maintain the Connection Asset it is recommended that they first consult with Energex. Asset ownership brings with it certain responsibilities including compliance with legislation, approvals, licence, and insurance requirements. The Connection Asset shall be designed and constructed in accordance with AS/NZS 3000 and the Connection Applicant shall be responsible for ongoing maintenance and operation of the asset. Connection Assets owned by the customer shall comply with Energex technical and performance standards at the Network Coupling Point. The Connection Applicant will not be required to use Energex for design and construction of these customer owned assets. HV construction owned by the Connection Applicant shall be audited by an accredited auditor authorised by the Electrical Safety Office prior to being energised.

Where the Connection Applicant decides to own the Connection Asset, the Metering Point shall be as close as possible to the Network Connection Point. (Refer Customer 3, Figure 1). This arrangement ensures a clear asset ownership and operational boundary between Energex and Connection Applicant.

5.4. Sharing of Assets and Reimbursement Schemes

If a new Connection Applicant is to be connected to an existing Connection Asset which was previously gifted to Energex, the original customer may be entitled to be reimbursed a portion of the original costs if connected within 7 years. The Energex contribution will be determined by the following method:

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Energex Contribution = \$E - \$C where

\$E = Cost of connection assets required to service Customer and Energex capacity requirements (e.g 1500 kVA transformer)

\$C = Cost of connection assets required to service Customer capacity requirements only (e.g 1000 kVA transformer)

This arrangement may also apply when Energex and the Connection Applicant agree that some capacity of new connection assets be allocated to Energex network. A specific example of this is an LV tie circuit to the network from a Customer's Distribution Substation (Refer Annex A - Example 2).

5.5. Works that may only be carried out by Energex

The following works may only be carried out by Energex

- Augmentation of the Network
- Design and Construction of any part of the connection assets within a Energex Bulk Supply or Zone Substation (e.g. 132/33kV, 66/11kV, 33/11kV substations)
- Design and construction of secondary systems and relay operated switchgear that will be part of Energex network
- Network Switching
- Final testing, commissioning, and connection of works.

5.6. Fees and Charges

The following fees shall be paid to Energex for services provided by Energex to facilitate the connection works. Energex reserves the right to recover any project fees levied by a third party on Energex. The actual fees and hourly rates will be provided by Energex.

Fee type	Purpose
Alternative material request	Evaluation of non-standard material requested by a Connection Applicant in accordance with Energex procedures.
Application	Payable on lodgement of an Application to Connect. Covers the reasonable costs of all work anticipated to arise from investigation of the Application to Connect and preparing the associated Offer to Connect.
Design and Estimation	Covers the reasonable costs of preparing the Design and estimating the costs of Connection Assets.
Design Submission or Re-Submission	Reviewing of Service Provider Design Drawings and alterations.
Field Audit	Inspection and audit of Works undertaken by Service Provider.
Powerlink and/or AEMO	Where applicable, other NSP or AEMO fees may apply.
Property & Easements	Costs associated with property transactions including easements if undertaken by Energex.
Switching	HV or LV switching required for the Connection Applicant.
Witness tests	Witnessing of testing carried out by Connection Applicants.

Table 2: Fees and Charges

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6. NETWORK PLANNING AND DESIGN CRITERIA

Connection of loads or generators shall be in accordance with the relevant NER Schedules 5.2 and 5.3. Key points are listed below.

6.1. Assessment of Maximum Demand and Energy Consumption

Energex will assess the Connection Applicant's maximum demand and estimated energy consumption based on information supplied by the Connection Applicant. This assessment will determine whether the application meets the criteria for a large connection and establishes the design parameters for network augmentation and Connection Assets. This assessment shall be carried out in accordance with Energex standards.

6.2. Technical Requirements for Connection of Generators

Generators cannot be connected to Energex Network without the approval of Energex (Electricity Regulation Section 28). Generators may require registration with AEMO and require a power purchase agreement with an Energy Retailer. Connection requirements are available from Energex and guidelines are given in the Energex Customer Standard for Small to Medium Scale Embedded Generation.

6.3. Protection

Connection Applicants shall ensure their facility complies with NER and Energex protection requirements and there are appropriate discrete primary protection schemes and isolation requirements at the remote customer to adequately protect the customer assets. It is appreciated that some level of remote back-up protection reach may be available from the Energex owned protection schemes to the customer assets. The zones of protection and back-up protection reach required if these schemes are to be determined by the customer and advised to Energex for application into the Energex owned relays. .

6.4. Metering

Connection Applicants shall ensure their facility complies with NER metering requirements. Connection Applicants should discuss these requirements with their Electricity Retailer. Metering installations must also comply with the requirements of the Queensland Electricity Connection and Metering Manual (QECMM).

Each connection point must have a metering installation. The Australian Energy Market Operator (AEMO) may refuse to permit a Market Participant to participate in the National Electricity Market (NEM) in relation to that connection point, unless this has been done [clause 7.1.2(b) of the National Electricity Rules (NER)].

The Responsible Person has formal responsibility for the provision, installation and maintenance of a metering installation [clause 7.2.1 of the NER]. This will be either the Financially Responsible Market Participant (FRMP) (e.g. Market Generator or Retailer) for the market connection point or, where agreement has been reached between the FRMP and the Distribution Network Service Provider (DNSP) - Energex Limited.

Except where the DNSP is the responsible person and is a registered Metering Provider, the Responsible Person must engage a registered Metering Provider of their choice to provide, install and maintain metering installations for which they are responsible. The NER allows the responsible person to engage different Metering Providers for different aspects of the metering services. For example, the responsible person may engage one Metering Provider to install the meter, another to test the measurement transformers, and a third Metering Provider to undertake routine maintenance. Although it is between the two parties to establish the contractual details, the Responsible Person cannot transfer its responsibilities under the NER to another party.

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If the DNSP contracts to be the Responsible Person and is also a registered Metering Provider, they are not required to engage an external Metering Provider but may choose to do so, using competitive tendering processes, if they wish [clause 7.4.2(c) of the NER].

6.5. Technical and Performance Standards

Connection Applicants facilities shall comply with technical and performance standards as defined in the NER and Energex Connection Agreement. (e.g. protection systems, disturbing loads, harmonic emission limits, and power factor).

6.6. Underground Power Line Planning Criteria

Within the geographical boundary of the Connection Applicant's property or development site the Connection Applicant generally has the option of overhead or underground reticulation. However, there may be state, local government or Energex requirements that stipulate the construction type. Similarly, if the Connection Applicant is required to construct a Connection Asset on public roads or land there may be state, local government or Energex policies prohibiting the installation of overhead reticulation.

The Connection Applicant should be aware that agreements may exist between Energex and other parties (e.g. Local/State Government, Queensland Rail) that may impact the design and construction of Connection Assets.

6.7. Design and Construction by Connection Applicant.

The Connection Applicant will need to decide whether they will require Energex to carry out the design and construction of the Connection Asset or use a Service Provider. The following are the requirements for Service Providers in the Energex Network areas.

Energex can provide a list of Service Providers who are authorised to carry out design and construction work for Connection Assets that will be gifted to Energex. Only Energex Service Providers can carry out this work. The company responsible for the project management must also be an Energex Service Provider.

If the Connection Applicant decides to use a Service Provider to design and construct the Connection Assets, the names of all Service Providers and their responsibilities shall be forwarded to Energex. The Service Provider appointed to project manage the construction of the Connection Assets shall be nominated.

6.8. Design Criteria

The Service Provider is responsible for submitting a compliant design in accordance with relevant Australian Standards, specific requirements of Energex, Codes of Practice and relevant legislation. All designs submitted to Energex shall be in electronic formats suitable both for direct printing of drawings and in a CAD format suitable for transfer to GIS and Asset Management systems. The files provided shall include;

- (i) Adobe PDF format with a paper size no larger than A1 and;
- (ii) CAD format readable by Energex's version of AutoCAD and to data specification as reviewed and notified from time to time.

Designs shall comply with Energex Works Plan standards.

Construction of HV electrical infrastructure or the ordering or purchase of HV electrical equipment shall not commence until design drawings have been approved by Energex.

As a minimum the following information shall be supplied to Energex for approval. Project design details shall be in accordance with the requirements of the listed technical standards. Any variations to these documents or specific requirements will be included in the Connection Agreement. Any delay in providing correct and adequate information will delay document approval.

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- (i) Schematic and geographic diagrams of the HV and LV electrical installation.
- (ii) A site layout identifying the positions and layout of substations, switchrooms, underground and overhead HV line routes. Substations and switchrooms shall be identifiable with the schematic.
- (iii) Calculations on the anticipated demand at each substation and total demand.
- (iv) Calculations on the anticipated power usage and load profiles for each transformer and a load profile for the project.
- (v) Underground cable routes and cable design data including cable installed in buildings. (e.g. trench cross sections, cable rating).
- (vi) Overhead reticulation routes and design data (e.g. design loads, component types, conductor ratings, line profiles).
- (vii) Design of substations including earthing designs.
- (viii) Design of switchrooms including earthing designs.
- (ix) A table listing the types of protection to be used for each particular item of equipment including the size of fuses and relay settings. Details of protection cascading shall be provided. Energex will advise whether it may be necessary to change protection equipment or alter relay settings.
- (x) Energex will advise whether SCADA or communication equipment is required. Designs and details on equipment to be used shall be approved by Energex.
- (xi) Position of metering. Discussions will need to be held with the Metering Provider. The Metering Provider will be appointed by the Retailer.
- (xii) Table of the type and size of transformers and switchgear to be installed.
- (xiii) Environmental assessments and construction management plan.

Any design changes by the Service Provider following approval by Energex are to be approved by Energex and may incur a design check fee.

6.9. Property and Easements

In situations where it is necessary to install a Connection Asset in a public place or on private land the Connection Applicant is responsible for obtaining all the necessary approvals, consents and preparation of relevant easement documentation required to enable registration of the easement, and paying any required fees. Energex will provide easement requirements for the overhead and underground infrastructure. Annex B details the approval process and documents required. Please note that easement conditions provided in Annex B are non-negotiable.

In rural areas, Wayleaves may be acceptable to secure 11kV and LV overhead Connection Assets.

6.10. Data Management

The Large Customer is responsible to meet the Data Management Standards required by Energex for the connection assets. These Standards are given in Appendix 5.

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6.11. Large Customer Connection Process

Figure 2 is a guide to the overall process.

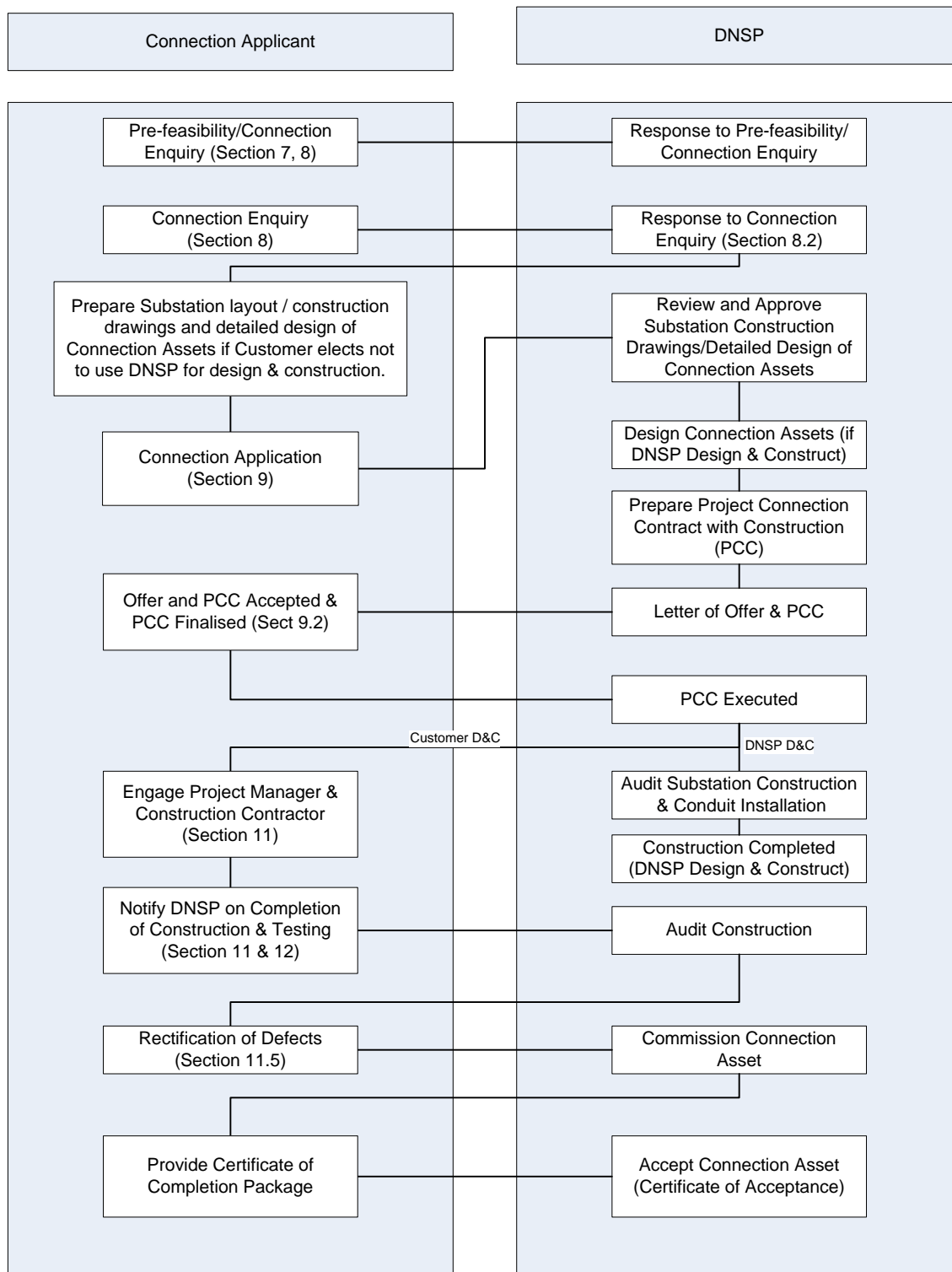


Figure 2: Connection Process

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7. PRE-FEASIBILITY ENQUIRY

This step allows the Connection Applicant to obtain basic details of the overall process from Energex and consider their options.

The Connection Applicant is required to submit a pre-feasibility enquiry form to Energex requesting basic information regarding the feasibility of a particular project.

Energex may provide a more detailed analysis for a project on a fee for service basis.

8. CONNECTION ENQUIRY

8.1. Enquiry

A formal connection enquiry shall be made by the Connection Applicant in accordance with Section 5.3.2 of the NER. Both the Connection Applicant and Energex shall comply with the NER.

The connection enquiry must be submitted on Energex Connection Enquiry form.

It is recommended that the Connection Applicant makes early contact with an Electricity Retailer. The installation cannot be connected unless there is an electricity supply contract between the Connection Applicant and an Electricity Retailer.

Typical timeframes for connections are described in Annex ED

Additional information may be required by Energex and this will be advised as necessary.

8.2. Response

8.2.1 Non Registered Participants

For non registered participants a response will be provided within 20 business days.

8.2.2 Registered Participants

NER requirements for response times to connection enquiries from Registered Participants are:

- Advise the Connection Applicant within 5 business days from receipt of the connection enquiry as to whether Energex requires any additional information. Clause 5.3.2(b) of the NER.
- Advise the Connection Applicant within 10 business days from receipt of the connection enquiry as to whether the enquiry would be more appropriately directed to another NSP. Clause 5.3.2(c) of the NER.
- Within 10 business days of receipt of a compliant connection enquiry Energex will develop a preliminary program showing proposed milestones for connection and access activities. The program will be discussed with the Connection Applicant and a formal program agreed upon. Clause 5.3.3(b) of the NER.
- Within 20 business days from receipt of a compliant connection enquiry advise the Connection Applicant what commercial information is required to assess the viability of the project. These details are in Section 6.6 and 6.7 of the NER. Clause 5.3.3(c) of the NER.
- Within 20 business days following the receipt of a compliant connection enquiry provide the following technical information to the Connection Applicant:
 - (i) The automatic access standards.
 - (ii) The minimum access standards.
 - (iii) The applicable plant standards.

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- (iv) The negotiated access standards that require AEMO involvement.
- (v) The normal voltage level.

If the Connection Applicant wishes to negotiate a change to the above standards and Energex agrees, the details shall be forwarded to AEMO for approval. AEMO will provide comment within 20 business days.

- Within 20 business days following the receipt of a compliant Connection Enquiry Energex will advise the Connection Applicant of all further information Energex requires to make a complete assessment of the connection requirements.
- Within 20 business days following the receipt of a compliant Connection Enquiry Energex shall advise the Connection Applicant of Energex fee structure.

If Energex is of the opinion that the connection of a new Connection Applicant will have an influence on the electricity supply or contractual agreements of other electricity users, it shall contact the affected users and also advise AEMO of the actions to be taken.

9. CONNECTION APPLICATION

After considering the information provided by Energex in the enquiry response, the Connection Applicant may make an Application for Network Connection Services in accordance with clause 5.3.4 and 5.3.4A of the NER. The Connection Applicant must pay the application fee and include the information specified in the Application for Network Connection Services Form and as requested in the Detailed Enquiry Response previously issued by Energex.

It will be necessary for the Connection Applicant and Energex to formalise the works program. This program may be amended on the agreement of both Energex and the Connection Applicant.

The Connection Applicant is responsible for obtaining planning and environmental approvals and necessary easements as required by Energex for new Connection Assets and these shall comply with all relevant legislation and Energex requirements.

9.1. Letter of Offer

Following the receipt of a compliant Application for Network Connection Services and in accordance with the time period specified in the preliminary program, Energex in accordance with clause 5.3.6(a) of the NER must provide an Offer for Network Connection Services to the Connection Applicant.

The Offer for Network Connection Services shall contain the proposed terms and conditions for connection to the network and may include a Project Connection Contract (with Construction). The Offer for Network Connection Services shall also include details of the site specific Access Standards and other technical requirements previously supplied to the Connection Applicant. Network and Energex Connection Charges payable by the Connection Applicant shall be included in the offer.

Both Energex and the Connection Applicant are entitled to negotiate with each other in respect to any matters relevant to the connection or supply of electricity.

9.2. Acceptance

When the Connection Applicant accepts the Offer to Connect the parties will finalise negotiations and enter into a Connection Agreement.

If required for the project, Energex will commence development of a detailed design at this stage.

For Registered Participants, following the signing of the Connection Agreement by the Connection Applicant, Energex and the Connection Applicant shall jointly notify AEMO that a connection agreement has been entered into between them and forward to AEMO the

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relevant technical details of the proposed plant and connection, including as applicable, the requirements of clause 5.3.7(g) of the NER.

9.3. Warranty and Bonds

Where a Connection Asset is designed and constructed by the Connection Applicant and gifted to Energex the asset shall be warranted, by the Connection Applicant, against defect, fault, and workmanship for a minimum of 2 years from the date of the issue of a Certificate of Acceptance.

In certain circumstances, and at Energex sole discretion, the minimum period may be increased to take into account the cost, complexity and maintenance requirements of the asset, or other issues considered necessary by Energex.

Energex reserves the right to request a warranty bond from the Connection Applicant prior to energisation of the project. The value of any bond will depend on the size and complexity of the project and the installation of any non-standard equipment. The bond will be returned on expiry of the warranty period subject to a final warranty check of the works by Energex and rectification of any defective works by the Connection Applicant to the reasonable satisfaction of Energex.

10. MATERIAL STANDARDS

10.1. Materials

Materials and plant necessary to construct the HV and LV Connection Assets can be purchased from Energex. Alternatively the Connection Applicant may purchase the materials on Energex Approved Material Supply List directly from the supplier.

Where the Connection Applicant intends to install equipment that is not included on Energex Approved Material Supplier List, a formal request shall be made requesting the use of this equipment. Energex may or may not consent to this equipment being installed.

If the Connection Applicant wishes to install non-standard equipment, the Connection Applicant shall satisfy Energex that the equipment complies with its standards. Energex standard procedures shall be followed. Non-standard equipment shall incur assessment costs, training and deployment costs and may require additional spares. An additional warranty may be required.

11. CONSTRUCTION STANDARDS

11.1. Substation Construction

For Connection Assets to be gifted to Energex the Connection Applicant is responsible for the construction of all substations switchgear buildings and enclosures in accordance with the requirements of Energex. The Connection Applicant is also responsible for maintaining the buildings and enclosures in a safe and structurally sound manner in accordance with the requirements of Energex (Electricity Regulation Clause 59).

11.2. Construction by Energex

Energex will use its own resources during the installation of the equipment. The Connection Applicant may be required to supply a number of auxiliary services to Energex during the construction period.

11.3. Construction by Service Provider

The Connection Applicant shall be responsible for ensuring that there is a safe system of work for all involved in the project in compliance with all applicable standards, statutory requirements and the Queensland Work Health and Safety Act and Regulations. The Connection Applicant may be required to develop a Construction and Safety Plan depending on the size and complexity of the project and pay any required fees.

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Construction of various activities can only be carried out by a Service Provider approved for the particular activity. All construction shall be in accordance with the construction drawings approved by Energex. Any variations shall be approved by Energex prior to the variation being carried out.

11.4. Construction program

The Connection Applicant shall submit a detailed construction program to Energex for approval prior to commencement of works. The program is to include project milestones and test points.

The program shall identify any work involving outages of Energex assets especially if it is necessary to isolate supply to existing customers. All efforts shall be made to ensure safe working methods are used whilst incorporating minimal outages. If outages to existing customers are unavoidable, the Connection Applicant shall be responsible for the provision of local generation to affected customers, the costs of which are to be borne by the Connection Applicant. If electricity supply outages are necessary to individuals or communities, the Connection Applicant shall meet all costs associated with the advertising and notification of the proposed outages. The time and length of any outages will be decided by Energex.

Defects identified during auditing must be promptly rectified.

If the construction is not completed within the agreed time and Energex suffers financial loss because of delays, Energex may recover any financial loss from the Connection Applicant.

11.5. Rectification of Defects During the Warranty Period

Energex may direct the Connection Applicant to arrange and fund the prompt rectification of any defective works identified by Energex during the Warranty Period. However, where the supply of electricity to other electricity installations is jeopardised, there are safety concerns or repairs are not being carried out in a specified time limit, Energex, at its own discretion, may complete repairs and recover the full cost from the Connection Applicant.

11.6. Equipment Labelling and Data Capture

Energex will provide to the Connection Applicant, details of operational and identification labels the Connection Applicant shall place on items of equipment, substation buildings and enclosures. The Connection Applicant shall provide, to Energex, a table identifying each item of equipment, label identification, make, model and serial number.

12. PRE-COMMISSIONING TESTING

The Connection Applicant shall ensure that all electrical and mechanical tests are performed in accordance with the appropriate regulations and standards. Pre-commissioning tests on certain equipment may be required. These tests will be listed in the testing program.

When necessary Energex will conduct its own tests and shall be responsible for the final commissioning and connection of the equipment. Close cooperation will be required between the Connection Applicant and Energex at all times during the testing, pre-commissioning and commissioning program.

12.1. Test reports and equipment manuals

Copies of all test and pre-commissioning reports shall be forwarded to Energex in an agreed timeframe prior to energisation. Copies of manufacturers test reports shall be submitted to Energex when received by the Connection Applicant.

Energex will provide to the Connection Applicant a list of equipment manuals it requires. Energex will already hold copies of some manuals and will only require copies of those it does not already hold. Copies of requested manuals are to be provided at the time when test and pre-commissioning is being carried out.

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12.2. Tools, Spares and Accessories

The Connection Applicant may be required to provide any tools, spares, and accessories necessary for the operation and maintenance of equipment.

12.3. Training

In situations where the equipment installed is non-standard, Energex may require operational and maintenance training to be supplied by the manufacturer. Energex will nominate key personnel to attend the training which will be required prior to energisation of the equipment. The Connection Applicant will be responsible for organising the training at a suitable time for Energex. All costs for the training including the labour cost for Energex personnel to attend the training will be the responsibility of the Connection Applicant.

13. ENERGEX CONTACT DETAILS

Network Service Centre Manager

P.O. Box 1461

Brisbane QLD 4001

Telephone: 07 3664 4000

14. DISPUTES

Energex contracts for construction works and connection shall have appropriate dispute resolution provisions and clauses. A party may also have the right to access dispute resolution provisions under other legislation e.g. the National Electricity Rules or Energy Ombudsman Act 2006 (Qld).

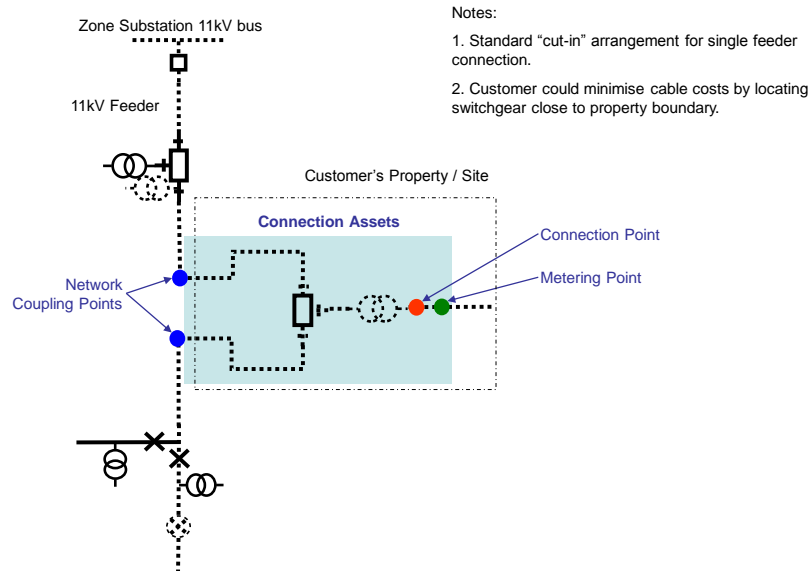
15. REVISION

Revision	Date	Comments
5.0	24/4/17	Amendments to metering sections for Power of Choice.

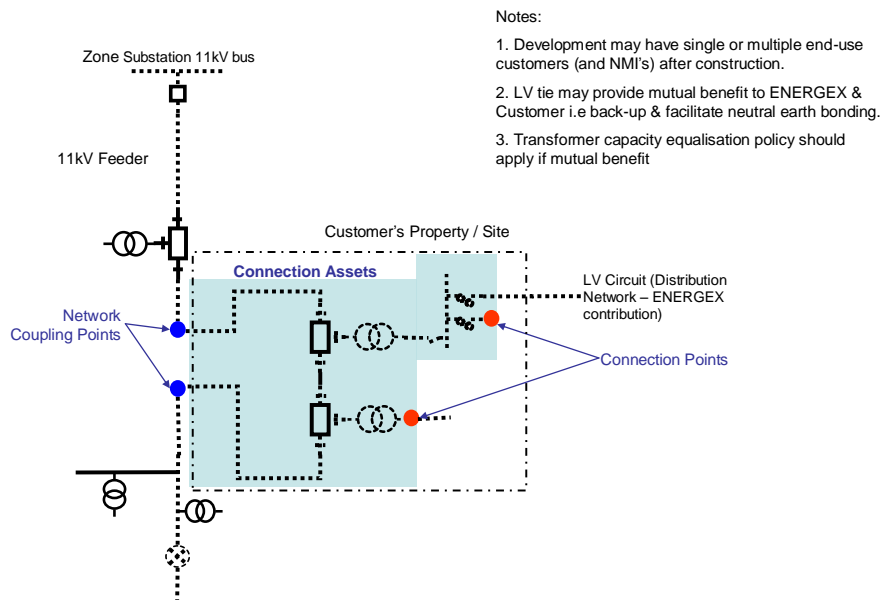
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APPENDIX 1 - EXAMPLES OF LARGE CONNECTION PROJECTS SHOWING ASSET BOUNDARIES

Example 1 – Simple Large Connection with 11kV & LV Connection Assets

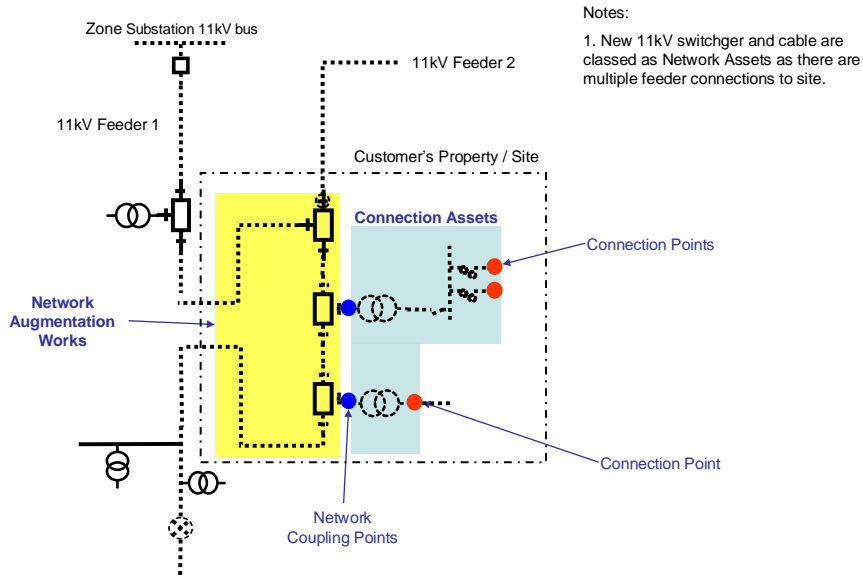


Example 2 – 11kV & LV Connection Assets – C&I Development

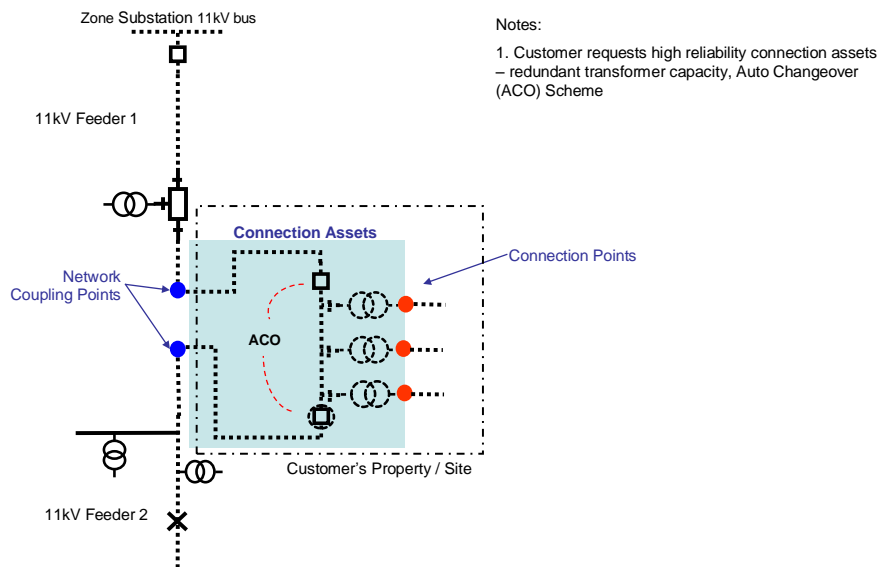


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Example 3 – 11kV & LV Connection Assets - Development with Multiple Feeder Connections

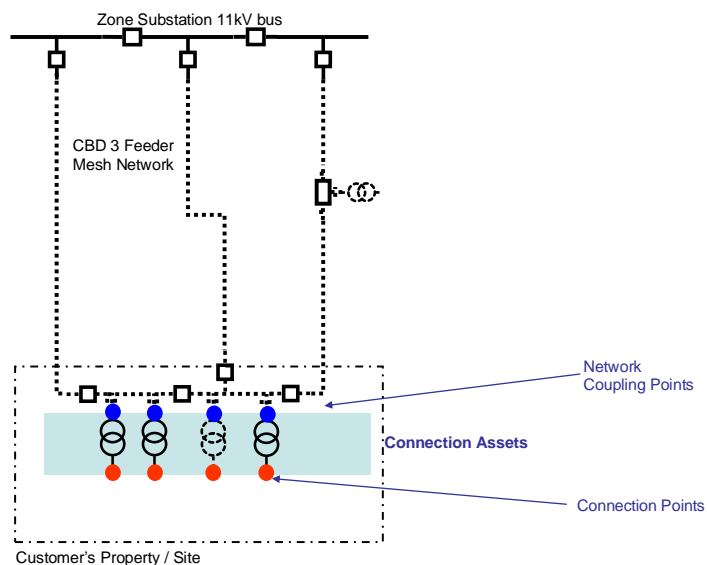


Example 4 – 11kV & LV Connection Assets – Customer requests Improved Reliability

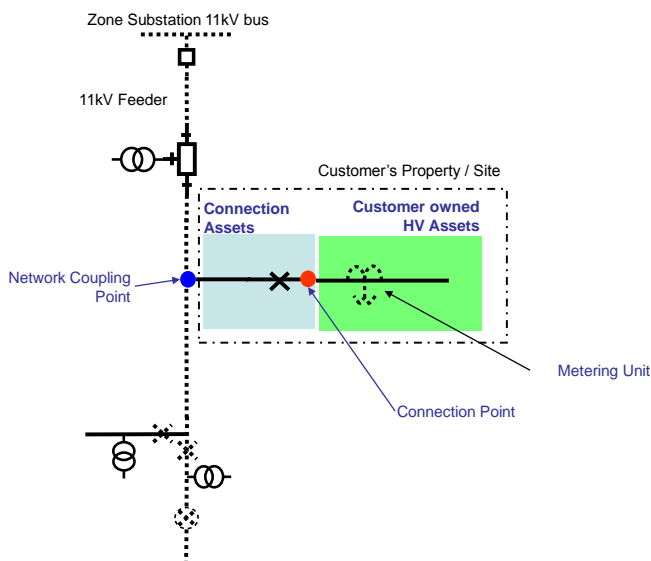


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Example 5 - CBD 11kV Mesh Network Connection, with LV Metering

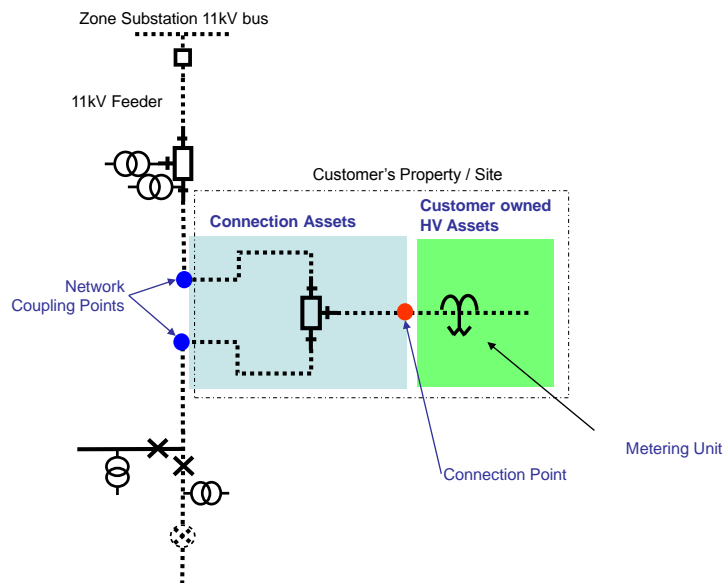


Example 6 – Simple HV Connection – Overhead Network

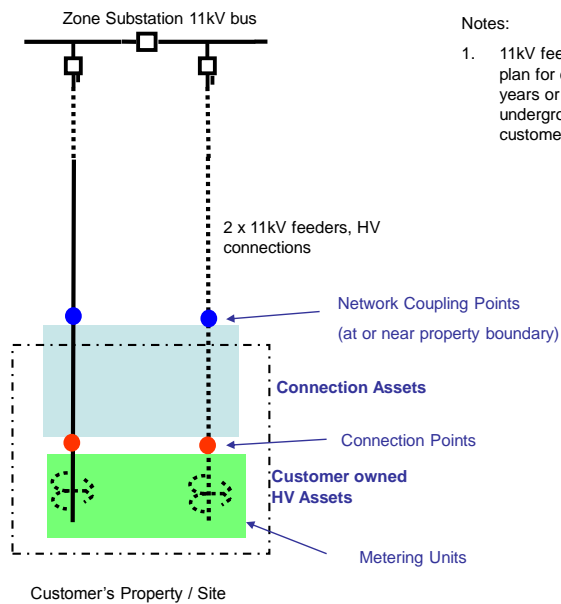


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Example 7 – Simple HV Connection – Underground Network



Example 8 – 11kV Connection to Network Feeder Assets

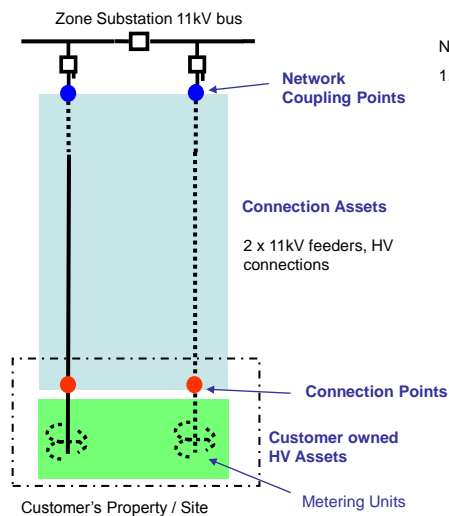


Notes:

1. 11kV feeders are network assets if there is a plan for connection of other customers within 7 years or involves multiple circuit overhead or underground construction servicing other customers.

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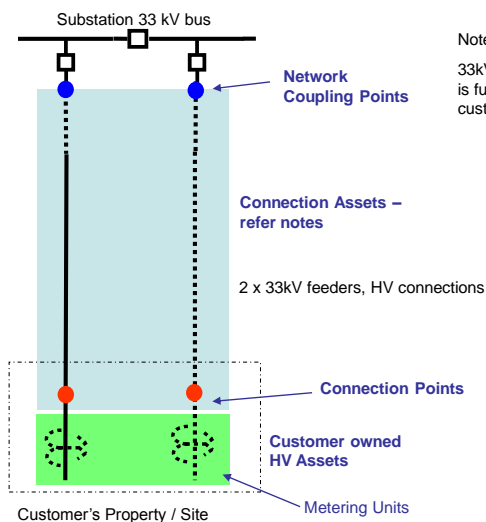
Example 9 – 11kV Connection – Feeder Connection Assets



Notes:

1. 11kV feeders are connection assets if there is no future plan for connection of other customers or does not involve multiple circuit overhead or underground construction servicing other customers.

Example 10 – Sub-Transmission Network – Feeder Connection Assets

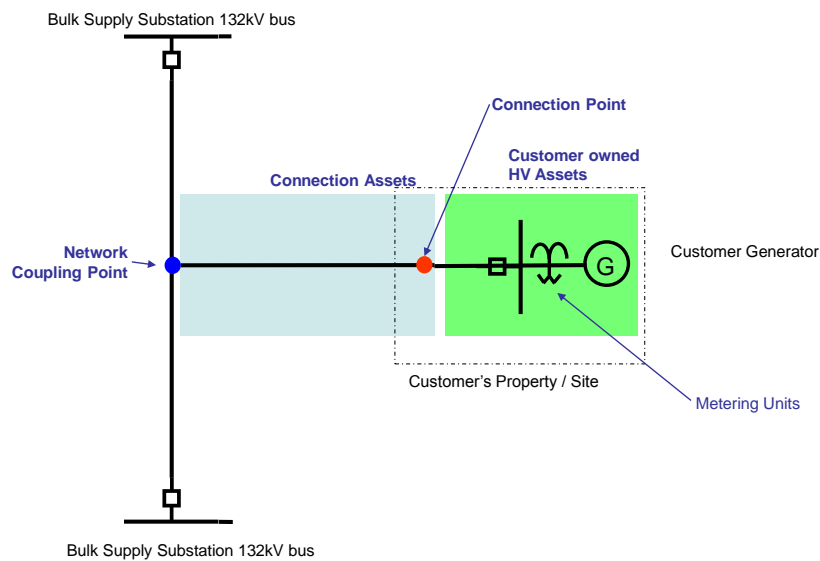


Notes:

- 33kV feeders would be network assets only if there is future plan for use as network servicing other customers within 7 years.

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Example 11 – Transmission Network Connection



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APPENDIX 2 - EASEMENT REQUIREMENTS

Where an easement is required to protect connection assets installed within freehold or state controlled land, Energex will require the following from the Connection Applicant:

- (i) a copy of the survey plan capable of registration showing the proposed easement to enable a review by Energex to ensure it meets their requirements prior to lodgement of the plan for registration, and
- (ii) the Form 9 easement document for execution by Energex, and
- (iii) a copy of the easement Registration Confirmation Statement from the Department of Environment and Resource Management.

It is the responsibility of the Connection Applicant to have the survey plan/s drawn, undertake negotiations with the property owner and interested parties (ie other easement holders, mortgagees, and trustees of reserves), and the easement documentation prepared in a manner acceptable for registration in the office of the Department of Environment and Resource Management.

Energex - Form 9 - Easement is to be completed in the following manner:

- (i) Item 5 to be "Energex Limited (ACN 078 849 055)" and should refer to the following relevant Dealing number:-
- (ii) For freehold properties privately owned for overhead, underground, padmount transformers and RMU's

Item 7 Purpose of Easement is to be shown as "Electricity Supply and Incidental Works".

Item 8 should refer to Memorandum No: 708346714

- (iii) For separately earthed transformers. (Clearance zone only not transformer site itself).

Item 7 Purpose of Easement is to be shown as "Electrical Works"

Item 8 should refer to Memorandum No: 706152965

- (iv) For easements over state controlled land for both overhead and underground.

Item 7 Purpose of Easement is to be shown as "Electricity Works"

Item 8 should refer to Memorandum No: 711950329

- (v) For easements over state controlled land – underground only.

Item 7 Purpose of Easement is to be shown as "Electricity Works"

Item 8 should refer to Memorandum No: 711950324

- (vi) For easements over state controlled land for both overhead and underground.

Item 7 Purpose of Easement is to be shown as "Electricity Works"

Item 8 should refer to Memorandum No: 711950329

- (vii) For easements over state controlled land – underground only

Item 7 Purpose of Easement is to be shown as "Electricity Works"

Item 8 should refer to Memorandum No: 711950324

Energex will first ensure that the easement details are satisfactory and then execute the documents and return them to the Connection Applicant for lodgement with the Department of Environment and Resource Management. All costs and outlays associated with the preparation and lodgement of the easement documentation are to be borne by the Connection Applicant.

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APPENDIX 3 - SUMMARY NER SCHEDULE 5.4 CONNECTION ENQUIRY

The following items of information are required to be submitted with a preliminary enquiry for connection or modification of an existing connection:

- (i) Type of plant - (eg. gas turbine generating unit; rolling mill, etc.)
- (ii) Preferred site location - (listing any alternatives in order of preference as well).
- (iii) Maximum power generation or demand of whole plant - (maximum MW and/or MVA, or average over 15 minutes or similar).
- (iv) Expected energy production or consumption (MWh per month).
- (v) Plant type and configuration - (e.g. number and type of generating units or number of separate production lines).
- (vi) Nature of any disturbing load (size of disturbing component MW/MVAr, duty cycle, nature of power electronic plant which may produce harmonic distortion).
- (vii) Technology of proposed generating unit (e.g. synchronous generator, induction generator, photovoltaic array, etc).
- (viii) When plant is to be in service - (e.g. estimated date for each generating unit).
- (ix) Name and address of enquirer, and, if relevant, of the party for whom the enquirer is acting.
- (x) Other information may be requested by Energex, such as amount and timing of power required during construction or any auxiliary power requirements.

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APPENDIX 4 - TYPICAL CONNECTION TIMELINES

Description of Works involved in Connection Application	Energex	
	Connection Agreement (Planning & Design undertaken)	Construction (from executed Connection Agreement)
CBD Indoor C&I Substation	12 months	24 months
Urban Indoor C&I Substation (Simple)	3 months	6 months
Urban Indoor C&I Substation (Complex)	12 months	24 months
Urban Outdoor C&I Substation (Simple)	3 months	6 months
132/110kV Overhead (OH) & Underground (UG) Sub-transmission works	18 months	24 months
Existing Bulk or Zone Supply Substation works	18 months	24 months
33kV UG works	12 months	24 months
33kV OH works	6 months	6 months

Approximate time taken to enter into a Connection Agreement (CA) from receipt of Connection Application.

Approximate time taken to energise the project after receiving a signed Connection Agreement from the Connection Applicant.

Simple – no augmentation of existing network.

Complex – Augmentation of existing network required, relay protection switchgear required, zone substation, 132/110kV, 66kV, 33kV, 22kV works.

These time frames are indicative only. Property acquisitions, easements, environmental approvals could affect these dates significantly.

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APPENDIX 5 DATA MANAGEMENT STANDARDS

The general requirements and information for data management are as follows:

- The Connection Applicant will need to collaborate with Energex to develop a satisfactory way to deliver the required data - appropriate formats and timing - so that the critical milestone prior to commissioning is achieved. The delivery of the required data by the critical milestone is necessary to allow Energex to publish this data to the ESRI GIS, Operating Schematics and Outage Management System, as well as equipment details (ratings, test results, nameplate info) to the Ellipse system. Suitable arrangements will need to be agreed at the beginning of the project to ensure delivery by the critical milestone. The updated process provides the trigger points for data and who will provide it.
- All distribution line designs shall be delivered using Energex's design tool (WorksPlan) using Ellipse Compatible
- Design information is required at the earliest opportunity so that a base model is available for the allocation of operating numbers and ID's, to trigger the generation of equipment records in Ellipse and to generate SCADA naming. The design should be built in Ellipse using compatible units and utilising the owner field for assets. That is, design to transmission assets and zone substation assets are required ASAP to generate numbers and should be provided soon after or even before the offer is made (e.g. investigations phase). Provision of numbers will enable the Connection Applicant to do design work. If the design changes, changes are required so that new / revised numbers can be given out. Transmission assets are more critical than distribution assets.
- The key at the early stage is for the Connection Applicant to provide a single line diagram, to Energex. Data requirements should be part of a checklist after the Connection Applicant signs off – one item is that the preliminary design brief goes to Energex as complete and as soon as possible. The connectivity model is required in a reasonable amount of time and the feeder configuration can't be changed until the assets are energised. This aspect represents the most critical timing. Designs for zone substation assets are approved internally, based on the single-line operating diagrams provided from the design process. Designs for transmission assets will be approved by Energex's nominated technical expert.
- From a legal perspective, drawings are considered to be the same as an asset. Sub-transmission and distribution design drawings may be provided in Energex's Microstation or AutoCad format. The Connection Applicant's contractor needs to provide a preliminary design, followed by updates as they become available. When the project is completed, the drawings are issued "as constructed" prior to Energex taking ownership. This approach will enable a clean handoff from design to construction to commissioning that meets Energex's requirements for data.
- Prior to the actual commissioning (the critical milestone), the appropriate data must be loaded and active in Energex's asset registers and asset management systems, in order for safe commissioning and operation of the commissioned plant to be carried out. No energisation (or asset transfer) should take place until all required data has been received and accepted by Energex.
- Capture, processing and input of data is to be charged to the Applicant with price quoted commensurate with the level of activity. This price is to be included in the contract and needs to be a verifiable estimate. Data includes information on equipment purchased, assets at the connection point, customer assets, connection assets, environment and cultural heritage. The price includes the amortised cost of the tool developed to capture information.
- If an asset is transferred to Energex, maintenance schedules need to be set up. This aspect can be covered with current procedures.
- From a cultural heritage perspective, whether Energex is to be responsible for ongoing maintenance or 'gifted' the completed asset, Energex employees will require access to information regarding any identified cultural heritage sites/objects within the asset area and any agreed / negotiated management plans. Permissions for this information / knowledge

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transfer will have to be sought from the relevant Indigenous Party(ies) at the time of identification. Then all works relevant cultural heritage information will have to be provided to Energex's Environment staff.