



# FACT SHEET: Project Design for Major Customer Connections

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## Purpose

The design of dedicated assets used to connect a Major Customer's premises to the Ergon Energy distribution network is an Alternative Control Service (ACS)<sup>1</sup>. For this service, Major Customers may elect to engage a third party Service Provider to design to complete the work. This Fact Sheet provides general guidance for Major Customers and their Service Providers who wish to design electrical infrastructure for use in connecting dedicated assets at a Major Customer's premises to Ergon Energy's electricity distribution network.

## Background

In order for a Major Customer to lodge an application for the connection of their premises to Ergon Energy's electricity distribution network, the Major Customer must submit construction and connection designs that have been endorsed by Ergon Energy. Ergon Energy's endorsement of these designs occurs prior to the Major Customers final RPEQ approval, and only remains valid for a period of three months.

Project designs may be created by Ergon Energy, the Connection Applicant or an appointed third party Service Provider, provided that such Service Provider is certified in accordance with the *Electrical Safety Act 2002* (Qld) to perform the relevant work. Ergon Energy can provide, on request, a list of recommended consultants to perform this service.

## Glossary

**AutoCAD:** AutoCAD is a commercial Computer-Aided Design (CAD) software product used for two- and three-dimensional design and drafting for specific technical applications.

**Construction Contract:** An agreement under which Ergon Energy and a Major Customer agree to carry out works to achieve a new or modified connection.

**DCT:** A reference to where assets are to be Designed and Constructed by a Major Customer and then Transferred to Ergon Energy for ongoing ownership and maintenance. Particular requirements apply to the design and construction of such assets.

**Ellipse:** Ellipse is an Enterprise Resource Planning (ERP) system used by Ergon Energy to manage internal and external resources, including assets, maintenance schedules, financial resources, materials and human resources.

**FdrSTAT:** FeederStat is an Ergon Energy system that is designed to record and monitor faults and asset events from initiation (logging the call) through to completion.

**Major Customer:** In this Fact Sheet, refers to a person intending to submit an application to connect to Ergon Energy (for either a new connection or modification of an existing connection) where the acceptance of that application and completion of necessary works will result in that customer being classified by Ergon Energy as any of an ICC (Individually

<sup>1</sup> For information on the classification of services, please refer to the [Economic Regulation and Classification of Services](#) Fact Sheet on the [Major Business Connections](#) section of Ergon Energy's [website](#).

Calculated Customer), CAC (Connection Asset Customer) or EG (Embedded Generator) in accordance with Ergon Energy's pricing proposal available on the [Network Tariff](#) section of Ergon Energy's [website](#).

**Major Customer (EG):** A Major Customer who is classified as an Embedded Generator under the abovementioned pricing proposal.

**Microstation:** Microstation is a commercial Computer-Aided Design (CAD) software product used for two- and three-dimensional design and drafting for specific technical applications.

**RPEQ:** Registered Professional Engineer of Queensland.

**Service Provider:** An entity providing a relevant design service.

**SmallWorld:** SmallWorld is a customised Geographic Information System (**GIS**), which produces Ergon Energy's Network Model, which in turn includes the distribution network connectivity, the distribution network asset hierarchy and information pertaining to the electrical and spatial parameters of devices.

## **Design Charges**

Major Customers should be aware that Ergon Energy will charge the Major Customer for some parts of the work associated with project design. Major Customers should contact their Project Sponsor to obtain further specific information.

## **Design Timeframes**

At the start of a project, the Major Customer must liaise with Ergon Energy to determine a satisfactory timeframe for the delivery of required design elements to achieve the critical milestone of commissioning. This timeframe is necessary to allow Ergon Energy to publish this information to the Smallworld GIS, Operating Schematics and Outage Management System (FdrStat), as well as to input equipment details (ratings, test results, nameplate info, etc) into Ellipse.

Note that Ergon Energy will need additional design information where the works concern assets that are to be transferred to Ergon Energy for ownership.

The preliminary design, reviewed by the customer appointed RPEQ, should be sent to Ergon Energy as soon as possible (upon or before execution of the Construction Contract) so that the design can be reviewed and a numbering system established. Following the review, redesign may be required.

Once the final certified design has been completed, this should be sent to Ergon Energy for endorsement.

Note that any delay in providing correct and adequate information will delay endorsement of the design by Ergon Energy as suitable for purpose.

Any design changes by a Major Customer following formal endorsement by Ergon Energy must be resubmitted for endorsement, which may result in delays and additional costs.

The Major Customer accepts the sole risk and expense in ordering or purchasing any equipment or materials, or starting any construction works, before the designs have been formally endorsed by Ergon Energy.

When the project is completed, "marked up" drawings are to be issued prior to Ergon Energy taking ownership of any assets. The design drawings should then be amended to "as constructed" drawings within a reasonable time frame, normally 3 months from asset transfer. A financial security may be required to cover the cost of completing this work in the event the Major Customer cannot complete as required. This approach will enable a clean handover from design to construction to commissioning that meets Ergon Energy's requirements for data.

Once an asset is transferred to Ergon Energy, the parties must establish maintenance schedules.

## Drawing File Formats

All drawings submitted to Ergon Energy must be in electronic formats suitable both for direct printing and in a CAD format suitable for transfer to GIS and asset management systems. The files provided must include:

- Adobe PDF format with a paper size no larger than A1;
- Line designs must be in CAD format readable and to data specification using Ergon Energy's External Design Tool (AutoCAD); and
- Zone substation electrical designs must be in CAD format readable by Microstation (Ergon Energy's preference) and compliant with Ergon Energy's design standards.

## Design Specifications

Submitted designs must be compliant with relevant laws, Australian Standards and codes of practice. In addition, where assets are to be gifted to Ergon Energy, these gifted assets must also comply with Ergon Energy's standards. The relevant specifications and any variations to these specifications will be set out in the relevant Construction Contract.

Generally, information relating to the design of assets that will be owned by Ergon Energy is available on the [Design & Construction Contractors](#) section of Ergon Energy's [website](#).

Specific relevant design references are set out below:

**Transmission, Zone, Generating and Switching Stations:** For transferable assets, the transmission, zone, generating and switching station design must comply with the Substation Design Standards available in the [Zone Substation Design and Construction](#) section and the [Design & Construction Contractors](#) of Ergon Energy's [website](#).

**Lines and Cables:** Line design and construction must comply with all applicable Australian Standards (including AS/NZS 7000:2010 "Overhead line design – Detailed procedures" and the Code of Practice – Works) and the guidelines of the cable manufacturer, and, for transferable assets, the Ergon Energy standards available in the [Subtransmission Line Design and Construction](#) section of Ergon Energy's [website](#).

**Earthing:** Earthing must comply with the requirements of the *Electrical Safety Act 2002* (Qld) and subsidiary regulations and, if applicable, Ergon Energy's Design Standards.

**Protection:** The Major Customer must liaise and negotiate with Ergon Energy's Protection Design group as to the type and electrical characteristics of high voltage and associated secondary equipment to be installed. This will allow Ergon Energy to install and set appropriate protection schemes both upstream and at the Connection Point, and manage the system. If Ergon Energy needs to install new and/or replace existing protection schemes as a result of this process, the Major Customer must pay those costs. Ergon Energy will advise whether it may be necessary to change protection equipment or alter relay settings.

**High Voltage Metering:** High Voltage metering design and installation should comply with the requirements of the nominated metering provider.

**SCADA and Distribution System Automation:** SCADA and Distribution System Automation design must comply with Ergon Energy's requirements relating to control and SCADA.

**Load Control and Load Shedding:** Load Control and Load Shedding design are to be based on the requirements of the particular installation and must comply with Ergon Energy's requirements relating to control and SCADA.

**Communications:** Communication systems may include protection, control systems, engineering access, telephony and environmental monitoring systems. Communication systems must comply with Ergon Energy's relevant communications requirements.

**Environment:** Ergon Energy is committed to responsible environmental management and to ensuring that all business activities associated with the supply of electricity are carried out with as little adverse impact on the environment as possible. The environmental impact of a project must comply with Ergon Energy's relevant environmental requirements.

**Cultural Heritage:** Whether Ergon Energy is to be responsible for ongoing maintenance or is 'gifted' the completed asset, Ergon Energy employees will require access to information regarding any identified cultural heritage sites or objects within the asset area and any agreed or negotiated management plans. Permissions for this information/knowledge transfer will have to be sought from the relevant indigenous party or parties at the time of identification. Then all cultural heritage information relevant to the works will have to be provided to Ergon Energy's Cultural Heritage staff..

## **Project Design Deliverables**

As a minimum, the following information must be supplied to Ergon Energy in a Project Design for formal acceptance:

- schematic and geographic diagrams of the complete electrical installation;
- a site layout identifying the positions and layout of substations, switch rooms, underground and overhead HV line routes (where substations and switch rooms must be identifiable within the schematic);
- geotechnical assessment;
- bulk earthworks design;
- calculations of the anticipated demand at each substation and total demand;
- calculations of the anticipated power usage and load profiles for each transformer and a load profile for the project;
- underground cable routes and cable design data including cable installed in buildings. (e.g. trench cross sections, cable rating);
- overhead reticulation routes and design data (e.g. design loads, component types, conductor ratings, line profiles);
- design of substations and switchrooms, including earthing designs;
- a list of the type and size of high-voltage plant to be installed;
- a list of the types of protection to be used for each particular item of equipment, including relay settings and the size of any fuses. Details of protection cascading shall be provided;
- if SCADA or communication equipment is required (as notified by Ergon Energy), designs and details of equipment to be used;
- position of metering (which will involve discussions with the relevant retailer, responsible person and metering provider); and
- planning, environmental and cultural heritage assessments and construction management plans that may impact on design.

 See Fact Sheet: *Planning Report and Project Scopes*

## **Modelling Information Required**

Modelling information required from Major Customers (both load customers and generators) is set out in Schedule 5.5 of the NER (in particular, clauses S5.5.3, S5.5.4 and S5.5.5).

For DCT construction options for line and substation assets, the information required includes:

- **Line Details:** pole co-ordinates, conductor type, earth wire type, pole top geometry showing conductor spacing, impedance data, design temperature for ratings and earthing impedances;
- **Cables:**
  - manufacturing details, such as cable cross-sectional detailed drawings, cable type, insulation type, impedance data and designed operating temperature;
  - construction details, such as co-ordinates of cable route, depth of burial, conduit size, bore logs, installed thermal resistivity of the native soil and backfill, details of adjacent circuits within 5 m and any cable crossings, earth bonding arrangement and bonding locations;
  - rating information, such as method used (manufacturer tables, commercial software etc), cyclic load or rating factors used, ground temperature assumptions, thermal resistivity values used (detailing tested or assumed values), thermal resistivity test results (if available) of bedding material, native soil and any grouts used, distributed temperature sensing tests (if applicable) and any other information relevant to cable rating. This information may be provided via a cable rating report;
- **Power Transformer/Power Regulator Details:** nameplate details, manufacturer drawings and manuals, general arrangement, test reports to show tap ranges, impedances, losses, vector group, etc.; earthing details (i.e. if earthing resistor or earthing transformer is used); AVR, WTI, OTI and controlled node settings; heat run test data at all cooling ratings for the applicable type test unit and oil test results since manufacture and during operation;
- **Capacitor Banks:** nameplate details and test reports, capacitance, inrush/blocking reactor details, earthing;
- **Shunt reactors:** nameplate details and test reports, earthing;
- **SVC or STATCOM:** VAR ranges, capacitor and reactor details, inrush/blocking reactor details, earthing, control details, etc.;
- **Earth Grid:** design details in regards to allowable fault current for step and touch potentials; and
- **Generally:** nameplate and rating information on circuit breakers, current transformers, isolators, etc.

For a Major Customer (EG), Ergon Energy also requires:

- details of the cables, lines, transformers, etc. between Ergon Energy's electricity distribution network and any generating units installed are required (regardless of ownership) so that the fault contribution can be modelled; and
- similar details as set out above for the generator transformer, lines, etc. Generator impedance data ( $X_d$ ,  $X_d'$ ,  $X_d''$ ,  $X_q$ ,  $X_q'$ ,  $X_q''$ ,  $X_o$ , etc.), star point earthing details, etc., which may vary depending on the type of generating unit (i.e. wind, solar, synchronous machine, asynchronous machine, etc.), control parameters and capability details of the generator (i.e. capability curve showing VAR limits, AVR settings, etc.).

## **Liaison in Respect of Protection and Control Systems**

In addition to the use of standardised primary and secondary connection arrangements, other protection requirements include:

- Ongoing Protection relay period contract is in place to supply Ergon Energy's protection relay requirements. The relay period contract stipulates relay types, lockdown relay firmware versions and proprietary off line setting/configuration software tools for use;

- Relay application guides are created for each relay application to ensure a consistent implementation of the respective relays across Ergon Energy assets. Relays are complicated, with specific thresholds being set on a case-by-case basis. This work is so far provided in-house;
- Where a protection scheme extends across a boundary (for example in a line current differential application) Ergon Energy and the Major Customer must negotiate the appropriate interface of the scheme based on current Ergon Energy standards. Ergon Energy needs to ensure the protection standard as implemented by the Major Customer is correct;
- All Ergon Energy protection asset devices have their operational configuration/settings managed in PDS. Furthermore, all configurable devices relating to Ergon Energy's Operational Technology should also have their configuration managed in PDS. The configuration data is currently populated in PDS by the Asset Management Operational Technology Protection team;
- The asset management of protection devices, like all other devices, is managed in Ellipse. The asset data for these devices is currently managed by the Asset Management Operational Technology Assets Group;
- The model Ergon Energy wishes to adopt is that of the existing Powerlink-Ergon Energy model. In this model, where Ergon Energy's Connection Point is a feeder bay emanating from a Powerlink-owned substation, the associated circuit breaker and corresponding secondary system assets (protection relays, CTs, VTs, DC supply etc.) that are used to protect the Ergon Energy feeder are Powerlink-owned assets. This avoids the complications of boundary issues for testing/maintenance, asset management, access to repository of protection relay setting/configuration management systems, operational/SCADA management systems and access etc.

## **Further Information**

Major Customers may contact their Project Sponsor to obtain further specific information.