ElectraNet

Generic Technical Interface

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ElectraNet

This document is in line with ElectraNet's design review requirements

Contents

Figures

1. Definitions

In this document the following words and expressions will have the following meanings:

Item	Meaning
AC	Alternating Current
AEMO	Australian Energy Market Operator
CCTV	Closed-circuit television
Contractor	A contractor engaged by ElectraNet or a Customer (including a third party IUSA provider engaged by a Customer or any contractor engaged by such third party IUSA provider) to perform any design, construction or related services in relation to assets or infrastructure which are connected, or to be connected, to ElectraNet's transmission network
Customer	A party who wants to establish or modify a connection to ElectraNet's transmission network but does not include a third party IUSA provider
DC	Direct Current
DCA	Dedicated Connection Asset
DNP3	Distributed Network Protocol v3
FMK	Field Marshalling Kiosk
FRMP	Financially Responsible Market Participant
GOOSE	Generic Object Oriented System-wide Events
HMI	Human Machine Interface
HV	High Voltage
IED	Intelligent Electronic Device
IP	Internet Protocol
IUSA	Identified User Shared Assets
IUSA Provider	The party providing the IUSA
IWA	Interface Works Agreement
LAN	Local Area Network
MC	Metering Coordinator
MDP	Metering Data Provider
MP	Metering Provider
MP(B)	Metering Provider (Class B)
NER	National Electricity Rules

Item	Meaning
NGM	National Grid Metering
NOA	Network Operating Agreement
PSPM	Power System Performance Monitor
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
third party IUSA	Has the same meaning as defined in the National Electricity Rules
TNSP	Transmission Network Service Provider
TNU	Transmission Network User

2. Purpose

The purpose of this document is to provide a summary of the generic technical interface works that will be required for a typical greenfield connection substation, and for a typical expansion of an existing substation (i.e. new bay).

3. Scope

This document covers the technical interfaces necessary for the safe and secure operation and maintenance of the substation, and the wider transmission network in accordance with the NER.

Detailed design of the interface must be undertaken by the IUSA Provider in conjunction with ElectraNet. The IUSA Provider is required to ensure that the design meets its intent in line with ElectraNet's functional requirements. The interface design, testing and commissioning plans will be provided to ElectraNet for review and acceptance.

Other engineering design and administrative interfaces including design reviews, change control, outage planning during construction and commissioning, documentation and drawing management, data and information management, commissioning, request to energise, land easement and site access and other such interfaces also need to be considered.

The technical interface for a generic IUSA comprises:

- Transmission line cut-in works and electrical and physical interface point on the substation gantry;
- Transmission line protection which includes the integration of the protection of the line which was cut-in, including remote-end works; and
- Telecommunications and operational data services required for the ongoing safe and secure operation and maintenance of the transmission network and the IUSA.

4. Referenced Documents

The table below lists applicable legislations, standards, referenced documents:

Legislation	
SAEA	Electricity Act 1996 (SA)
SAER	South Australia Electricity (General) Regulations 2012 (SA) under the SAEA
NER	National Electricity Rules
ETC	Electricity Transmission Code TC/08

International Standards	
IEEE Std 400.2:2013	Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE Std 442:1981 (r2003)	Guide for Soil Thermal Resistivity Measurements.
AS/ISO 1000:1998	The international system of units (SI) and its applications.
AS 1012.1:2014	Methods of Testing Concrete - Sampling of concrete
AS/NZS 1125:2001 + Amdt 1:2004 (R2017)	Conductors in insulated electric cables and flexible cords
AS 1141:various	Methods for sampling and testing aggregates
AS 1289.2.1.1:2005 (R2016)	Determination of the moisture content of a soil - oven drying method
AS 1289:various	Methods of Testing Soils for Engineering Purposes
AS 1319:1994	Safety signs for the occupational environment
AS 1379:2007	Specification and supply of Concrete
AS/NZS 1429.1:2006 (R2017)	Electric cables – Polymeric insulated – For working voltages 1.9/3.3 (3.6) kV up to and including 19/33 (36) kV
AS/NZS 1429.2:2009	Electric cables – Polymeric insulated – For working voltages above 19/33 (36) kV up to and including 76/132(145) kV
AS/NZS 2053.2:2001 (R2016)	Conduits and fittings for electrical installations - Rigid plain conduits and fittings of insulating material
AS 2067:2016	Substations and high voltage installations exceeding 1 kV a.c.
AS/NZS 2648.1:1995	Underground Marking Tape - Non-detectable tape

International Standards	
AS 2758.1:2014	Aggregates and rock for engineering purposes. Part 1: Concrete aggregates
AS/NZS 2857:1996 (R2017)	Timber drums for insulated electric cables and bare conductors
AS/NZS 3582:various	Supplementary cementitious materials
AS 3972:2010	General purpose and blended cements
AS 3983:1991 (R2016)	Metal Drums
AS 4436:1996 (R2016)	Guide for the selection of insulators in respect of polluted conditions.
AS 4702:2000 (R2013)	Polymeric Cable Protection Covers
AS/NZS 60137:2008	Insulated bushings for alternating voltages above 1000 V (IEC 60137 Ed 5 (2003) MOD)
IEC 60099	Surge Arresters
IEC 60332:various	Tests on electric and optical fibre cables under fire conditions
IEC 60754:various	Test on gases evolved during combustion on materials from cables
IEC 60287-1-1 Ed.2.1:2014	Electric cables - Calculation of the current rating - Part 1-1: Current rating equations (100% load factor) and calculation of losses - General
IEC 60502-2 Ed 3.0:2014	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV)
IEC 60840 Ed.4.0.:Bilingual 2011	Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) – Test methods and requirements
IEC 60853-1 Ed.1.0:1985 + Amd.1 & .2:2008	Calculation of the cyclic and emergency current rating of cables. Part 1: Cyclic rating factor for cables up to and including 18/30 (36) kV
IEC 60853-2 Ed.1.0:1989 + Amd.1:2008	Calculation of the cyclic and emergency current rating of cables. Part 2: Cyclic rating of cables greater than 18/30 (36)kV and emergency ratings for cables of all voltages
IEC 62271-209 Ed 1.0:2007	Cable connections for gas-insulated metal enclosed switchgear for rated voltages of 72.5 kV and above-Fluid filled and extruded insulated cables – Fluid filled and dry type cable-terminations
I.S. EN 50181:2010	Plug-In Type Bushings Above 1 kV up to 33 kV and from 250 A to 2500 A for equipment other than liquid filled transformers.

International Standards	
ASTM D5334-08:	Standard Test Method for Determining the Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure.
ESAA Guide D(b) 26:1995	Guide for Working on Cables and Ancillary Equipment under Induced Voltage Conditions and Transferred Earth Potentials
CIGRE Technical Brochure 303:	Revision of qualification procedures for high voltage and extra high voltage AC extruded cable systems

ElectraNet's Documentation	
1-09-FR-01	Protection Common Functional Requirements
1-09-FR-14	Switchgear Interlocking
1-09-FR-20	Substation Automation System
1-09-FR-30	Network Performance Monitoring System
1-09-FR-33	Generic Commissioning Requirements Including Typical Timescales

5. Greenfield IUSA / DCA Interface

5.1 General Interface Requirements

Under the NER, the incumbent TNSP, ElectraNet, is required provide the following interface works:

1. Transmission line cut-In works;
2. Remote end protection works;
3. RTU and HMI Systems; and
4. Telecommunications Systems to support protection, SCADA and the ongoing operations and maintenance of the substation.

The IUSA Provider must ensure that other facilities such as fences, gates, oil containment, roadways, ducts, trenches, surface covering, and other physical site infrastructure as required, are designed and constructed in accordance with ElectraNet's design standards, in particular noting any diversity and redundancy requirements.

It should also be noted that ElectraNet will negotiate and enter into a Transmission Connection Agreement with the Generator / Load connecting party, which may result in further interface requirements.

5.2 Electrical Interface

The electrical interface between the IUSA and the rest of ElectraNet's transmission system will be the landing gantry in the substation facility. The interface between the IUSA and the DCA will be the exit gantry in the substation facility. Refer to Figure 5-1 Electrical Interface.

In designing the electrical interface, the following must be considered:

1. The IUSA Provider must, in conjunction with ElectraNet, determine the most appropriate location for the landing gantry to terminate the lines from the new cut-in tower that facilitates the electrical connection of the IUSA to the transmission network;
2. The IUSA Provider must, in conjunction with the owner of the DCA, determine the most appropriate location for the landing gantry to terminate the lines from the Generator / Load facility;
3. The IUSA Provider must design and construct the earth grid in accordance with ElectraNet's design standards and functional specification. This will take into account current and ultimate fault current that is envisaged at the connection point; and
4. The IUSA Provider must also provide at least two earthing points for all ElectraNet and DCA assets (e.g. landing tower, ElectraNet building, etc.).

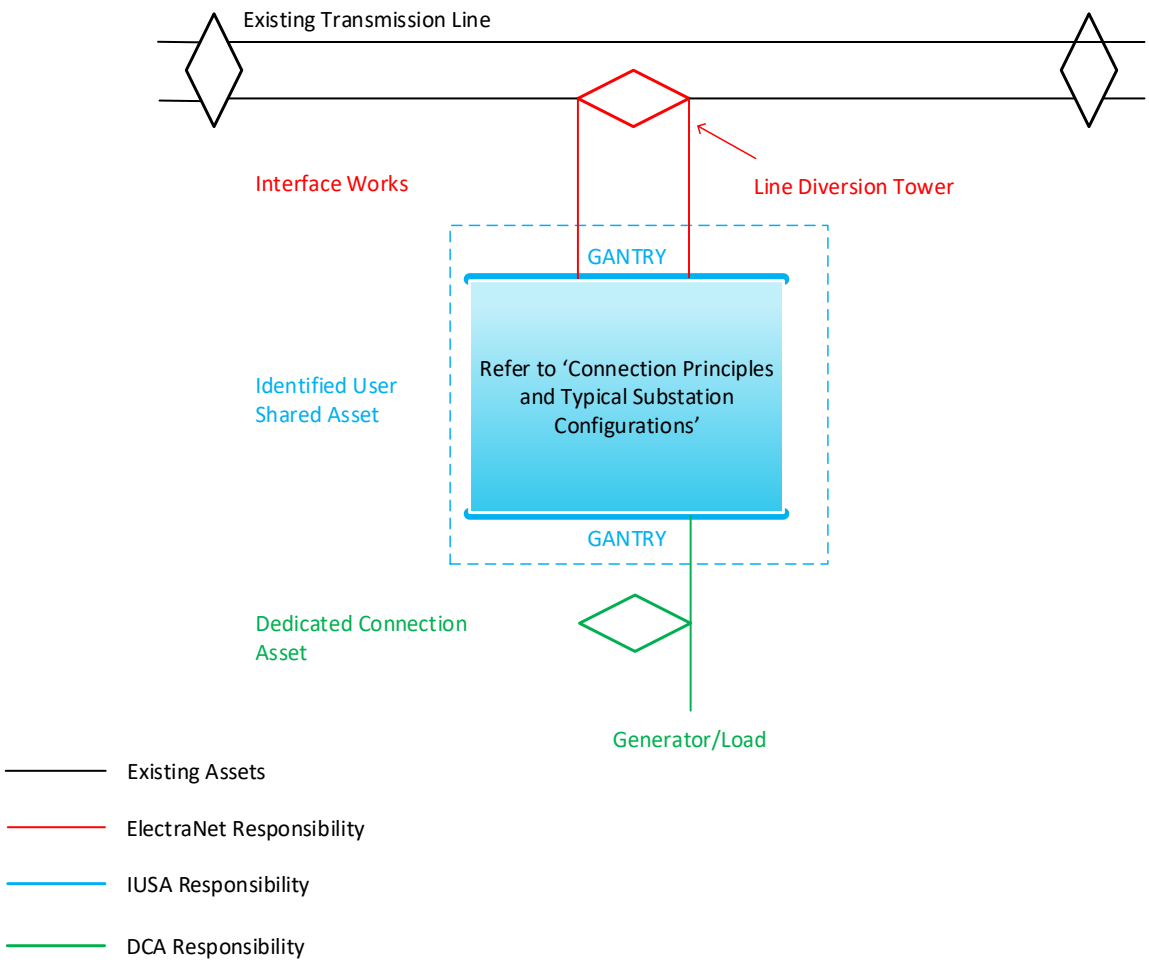

Figure 5-1 Electrical Interface

5.3 Protection

5.3.1 Protection System Objectives

The fundamental protection system objectives to be considered in the connection of IUSA Provider sites to ElectraNet's electricity transmission system are:

1. The minimisation of the potential hazard to life and property;
2. The minimisation of equipment damage; and
3. The potential impact on system stability.

Furthermore, no new site which connects to ElectraNet's electricity transmission system should degrade the existing performance of the electricity transmission system or any other user. In view of these objectives, ElectraNet requires the connecting circuit's protection systems to rapidly clear any power system fault occurring along the length of the protected circuit whilst restraining for power system faults occurring beyond the length of the protected circuit.

5.3.2 Protection System Philosophy

ElectraNet's requirements, defined within 1-09-FR-01 Protection Common Functional Requirements, mandate that protection systems must be designed such that all power

system faults are detected by at least two independent, high speed main protection systems. The outputs of the protection systems must be selectively allocated to independent tripping systems supplied from separate DC systems.

5.3.3 Protection System Equipment

The circuits which provide the connection to the IUSA site must be protected using ElectraNet's Standard Feeder Bay Solution which comprises of redundant Set X and Set Y current differential protection (IEDs) with integral direct transfer tripping and back-up protection.

5.3.4 Protection System Demarcation

ElectraNet, as the incumbent TNSP, will undertake the design and installation of the non-contestable components of the connecting circuit's protection within its connected substations. To enable the IUSA Provider to optimally design and construct the contestable components of the circuit protection within the IUSA site, ElectraNet will provide the generic engineering and design items defined within Table 1 below. ElectraNet and the IUSA Provider will undertake joint commissioning of the connecting circuit's protection systems in accordance with the IWA. The IUSA Provider and ElectraNet will be jointly responsible for modifying ElectraNet's Standard Feeder Bay Solution to allow integration into the IUSA site's infrastructure.

Table 1 Engineering and Design Items Provided by ElectraNet

Item No.	Item Description
1	Set X protection IED ordering information
2	Set X Feeder Protection generic AC and DC Schematic Diagrams
3	Set X Feeder Protection generic IED configuration file.
4	Set X Feeder Protection Setting Guidance Document
5	Set X Feeder Protection Inspection and Test Plans
6	Set Y Protection IED ordering information
7	Set Y Feeder Protection generic AC and DC schematic diagrams
8	Set Y Feeder Protection generic IED configuration file
9	Set Y Feeder Protection Setting Guidance Document
10	Set Y Feeder Protection Inspection and Test Plans

5.3.5 Protection System Physical Interface

The protection interface must be the optical fibre patch panel within ElectraNet's telecommunication building, located within the IUSA site. A dedicated connection is required for each set of protection, for each connecting circuit as illustrated in Figure 5-2. The protection IED must interface to ElectraNet's telecommunications equipment over multimode fibre, using IEEE Std C37.94-2017 optical fibre interfaces.

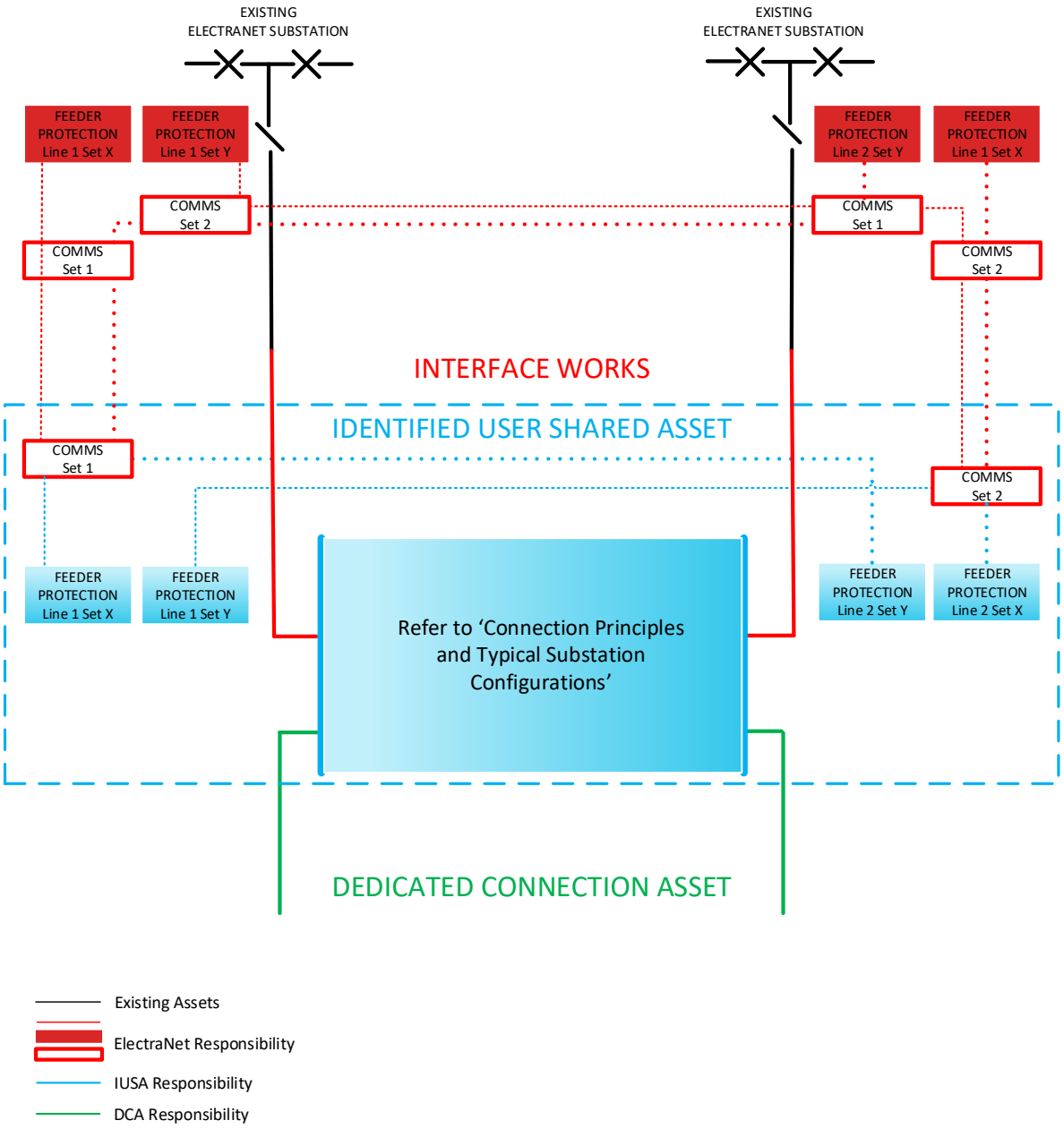

Figure 5-2 Typical Greenfield Protection Interface

5.4 National Grid Metering

For the sites where the IUSA is created for a third party proponent and the third party is also identified as the FRMP as per NER Chapter 7, the FRMP may choose to operate as the Metering Coordinator (MC).

ElectraNet as incumbent TNSP is obliged to offer the MC services to the FRMP under NER. ElectraNet will thereafter perform the functions below in its role as MC (as defined within the NER):

1. Ensure all NGM assets are to be compliant with Chapter 7 of the NER;
2. Ensure the assets are installed, calibrated and commissioned by an AEMO registered MP;
3. Facilitate the FRMP to engage the Metering Data Provider (MDP);

4. Undertake the dialogue and required communication with Australian Energy Market Operator (AEMO) for the approval of the wholesale connection point;
5. Undertake the dialogue and required communication with AEMO metering unit to facilitate the approval of the generation registration from AEMO Onboarding Unit;
6. Undertake the maintenance of the National Grid Metering (NGM) facility through nominated MP(B);
7. Maintain the required databases and undertake the recalibration of the facility as required under NER; and
8. Undertake the weekly NGM data reconciliation.

The FRMP must also ensure that shared assets within its boundary which are used for the NGM must comply with requirements of NER Chapter 7 for the metering class nominated by ElectraNet as MC.

In case the FRMP elects to take on the MC role, ElectraNet prefers that the NGM assets be contained within the IUSA boundaries. FRMP as third party MC will assume all the responsibility for the NGM installation including design, commissioning, approvals, maintenance and recalibration in accordance with the NER Chapter 7. The FRMP as MC must also be responsible for providing the metering data to ElectraNet for its use through the nominated Metering Data Provider (MDP).

5.5 Telecommunications

5.5.1 Building

ElectraNet will supply a transportable building to house telecommunications, networking and site security equipment in accordance with ElectraNet's design standards. Refer to Figure 5-3 Telecommunications and Data Interface.

The IUSA Provider, must in conjunction with ElectraNet, determine the most appropriate location for the installation of a transportable building. The IUSA Provider must provide a high availability AC supply to this building. The IUSA Provider will also ensure this building is provided with, and has access to two physically diverse ducts/conduits system for all intra-substation cabling (control/SCADA and telecoms cablings) respectively. The IUSA Provider must ensure safe pedestrian and vehicular access to and from the building (including provisions for parking, unloading and loading of equipment into vehicles).

The detailed scope of this work will be defined in the IWA.

5.5.2 Telecommunication Bearers

Telecommunication bearers predominantly take the form of optical fibre in ground wire, buried fibre or digital radio.

In some cases, one or both bearers may need to be provided over a radio link. In this instance, a radio tower will need to be installed within the IUSA compound. The radio tower will need to be in close proximity to ElectraNet's equipment room and be connected either via dedicated radio frequency feeder conduits or overhead cable gantry.

Earthing of the radio tower as well as any associated works to create common earths for the coaxial feeder cables will need to be undertaken by the IUSA in conjunction with ElectraNet and in accordance with ElectraNet's design standards.

The IUSA design must include appropriate civil infrastructure, including road ways for heavy vehicles to get access to the tower, as well as a hard stand for cranes and cherry pickers as required.

Details of the telecommunication bearer interfaces will be defined in the IWA.

5.6 Data Services

All services will be presented in ElectraNet-provided cubicles (one for the primary set of services, the other for the redundant set). These panels will be required to be housed within the IUSA control room. The panels will provide multimode fibre interfaces (for all data services) and copper interfaces (for telephony services). The IUSA Provider is responsible for cabling up to the panels and connecting to the appropriate interface port. Refer to Figure 5-3 Telecommunications and Data Interface.

The IUSA Provider must ensure there is adequate space for the cubicles and will provide redundant 110V DC supplies to each cubicle.

Details of the services scope of work as well as any interfaces will be defined in the IWA. For a generic design of the telecommunications interface works refer to Figure 5-3 Telecommunications and Data Interface.

5.6.1 Substation Local Area Network (LAN)

ElectraNet will supply a redundant set of switches to connect all IEDs (relays, bay controllers, etc.) to the substation LAN. The substation LAN will form the basic communication medium for all SCADA, HMI, configuration and fault data traffic. Each type of traffic will be placed onto a separate virtual LAN in accordance with its criticality, priority and traffic profile.

The IUSA Provider must also work closely with ElectraNet to define the data services interface details. A sample of the Services Details Form can be found in Appendix A.

5.6.2 SCADA

ElectraNet will supply a redundant set of Remote Terminal Units (RTUs) for the purposes of interfacing the substation SCADA data from the protection and control IEDs to ElectraNet's Energy Management System and AEMO. ElectraNet will also supply a local HMI server which must communicate and provide local site monitoring and control / operator functions.

ElectraNet's requirements, defined within 1-09-FR-20 Substation Automation System, requires that substation automation systems must be designed such that there is no single point of failure which can result in the loss of monitoring of complete or any large part of the substation assets from local and remote control points. It requires provision of a bay control unit for collecting I/Os for each substation bay to meet this requirement.

The Feeder Bay solution IEDs and bay control units provided by the IUSA Provider must be connected to the ElectraNet's substation LAN via multimode interface with redundant Ethernet connections. These IEDs must exchange data and controls with

ElectraNet SCADA Gateways via IEEE 1815-2012 — IEEE Standard for Electric Power Systems Communications-Distributed Network Protocol (DNP3) and will operate over an Internet Protocol (IP) transport layer (i.e. DNP3 over IP) as defined in the 1-09-FR-20 Substation Automation System.

If the IUSA Provider wishes to propose a proprietary SCADA system (including 61850) that meets ElectraNet's functional requirements, the IUSA Provider must interface their RTU to the ElectraNet RTU.

Details of the SCADA scope of work as well as any interfaces will be defined in the IWA.

5.6.3 HMI

ElectraNet will supply an HMI Server and Client in the Control building for the purpose of monitoring and operator control of the substation from within the control room. Whilst the server must reside in the cubicle, the client equipment (keyboard, mouse, screen, etc.) will reside on a desk. The IUSA Provider must provide an appropriate desk for the HMI client equipment.

5.6.4 Performance Monitoring

ElectraNet will provide a PSPM to monitor and manage the network transmission line to the remote substation in accordance with the requirements of 1-09-FR-30 Network Performance Monitoring System. The PSPM includes travelling wave fault location facilities in accordance with the requirements of 1-09-FR-30 Network Performance Monitoring System.

ElectraNet will also provide a site server for the purposes of engineering access to the various IEDs on site. The IUSA Provider must hand over to ElectraNet all relay management software, performance logging software, and other electronic interface that ElectraNet may require in order to remotely manage the configuration and performance of all IEDs on site. Software to download logs from all IEDs to monitor and manage the network and substation performance must also be provided by the IUSA Provider.

5.6.5 Security

The IUSA Provider must design and construct all security infrastructure that is required including alarm systems, CCTV cameras, etc. ElectraNet will provide all ElectraNet-specific equipment including key locks, alarm panels, etc. to ensure it is compatible with existing ElectraNet systems.

This will be provided as an IP service using multimode optical fibre, to allow substation security infrastructure (cyber keys, cameras, etc.) to communicate and access remotely by ElectraNet's operations centre.

Details of the security scope of work as well as any interfaces will be defined in the IWA.

5.6.6 Telephony

ElectraNet will provide two traditional telephony services provided over copper pairs. One service will originate from ElectraNet's internal operational telephony system and

the other from a third party carrier. They must be provided over diverse paths using twisted pair copper tie cable.

5.6.7 General Data Service

ElectraNet will provide a wi-fi access point, in either ElectraNet's equipment room or the IUSA control room to access the internet. This can be used to then connect to corporate VPN service for construction, operations and maintenance communications.

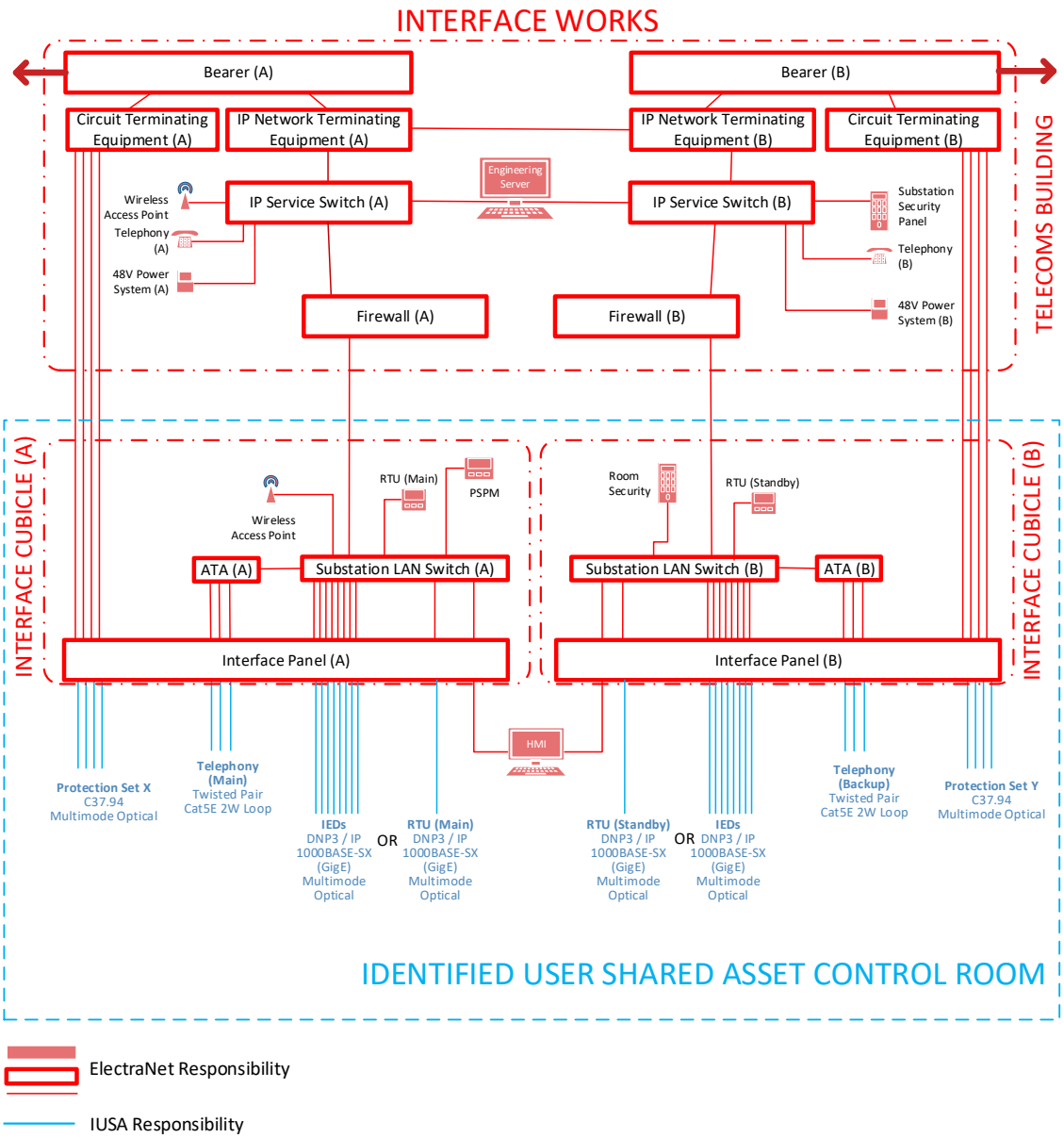

Figure 5-3 Telecommunications and Data Interface

5.6.8 Permissive to Close Signal

A Permissive to Close Signal must be implemented on all circuit breakers within the IUSA that are used to switch the DCA circuit. The objective of the Permissive to Close function is to provide ElectraNet with formal confirmation, from the DCA operator, that the DCA facility is in a state of readiness to receive a supply from ElectraNet's electricity transmission network. What constitutes the state of readiness will be

determined by the DCA facility operator, but as a minimum ElectraNet would expect it to provide confirmation that all personnel are clear, and all plant & equipment within the DCA facility is in a safe condition and is ready for energisation. The implementation requirements for the Permissive to Close signal are defined within ElectraNet's suite of Functional Requirements documents.

6. Existing Substation Expansion Interface

There are three scenarios to expand an existing substation:

1. A new IUSA within an existing ElectraNet-owned substation;
2. A new IUSA within a substation owned by a third party that is operated and maintained by ElectraNet; and
3. A new IUSA owned by ElectraNet within a substation owned by a third party that is operated and maintained by ElectraNet.

6.1 Existing Site Infrastructure and Services

For an existing site, it can be assumed that the site is already established and that ElectraNet and/or the site owner would already have fences, gates, oil containment, roadways, ducts, trenches, surface covering, landscaping, and other physical site infrastructure as required, designed and constructed in accordance with ElectraNet's design standards.

The site should also have existing redundant AC and DC supplies, and the existing generator (if applicable).

The site will also have ElectraNet telecommunications bearers, services, line protection panels, SCADA gateway, NGM, network and asset performance management equipment, and site security equipment in accordance with ElectraNet's design standards.

The scope of this work (which will be defined in the IWA) will be limited to expanding this above infrastructure and extending it to the IUSA as required.

6.2 Earthing

The IUSA Provider must design and construct the earth grid in accordance to ElectraNet's design standards and ensure it is seamlessly incorporated into the existing earth grid.

The IUSA Provider must also provide at least two earthing points for all DCA assets (e.g. DCA landing tower, etc.) as required.

6.3 Primary Plant and Civil Works

The IUSA Provider must design and construct all primary plant including civil works (bench, footings) and bus works in accordance with ElectraNet's design standards.

The IUSA Provider will provide field marshalling kiosks (FMKs) at a convenient location so any connections (input/output) from ElectraNet relays to field equipment can be made at the FMK.

6.4 Lines

The IUSA Provider must provide a suitable location for the landing structure for the DCA. The scope of this work will be defined in the IWA.

6.5 Protection

6.5.1 Protection System Objectives

As per Section 5.3.1.

6.5.2 Protection System Philosophy

As per Section5.3.2.

6.5.3 Protection System Equipment

In the majority of brownfield applications the connections to the IUSA facilities within an existing ElectraNet substation will be protected by an augmentation of the existing protection systems, for example, an additional circuit added to an existing bus zone protection system.

6.5.4 Protection System Demarcation

ElectraNet, pursuant to its obligations as the incumbent TNSP, will undertake the design and installation of any augmentation of existing protection systems. The IUSA Provider must provide the necessary current and voltage transformers to facilitate the augmentation of ElectraNet's protection systems.

6.5.5 Protection System Physical Interface

As a general rule, ElectraNet's protection systems should not be relied upon to protect the IUSA equipment. The physical protection system interface between the IUSA facility's protection systems and the existing ElectraNet protection systems will be defined within the IWA but the following general principles will apply:

1. The IUSA Provider must provide the necessary current and voltage transformers to facilitate the augmentation of ElectraNet's protection systems.
2. The preferred arrangement for the transfer of trips between the IUSA protection systems and ElectraNet's protection systems is via metallic cables. In instances where the IUSA protection systems are supplied from dedicated IUSA direct current systems, optical transfer trip interfaces are preferred.

Refer to Figure 6-1 below for a diagrammatic representation of the protection interface.

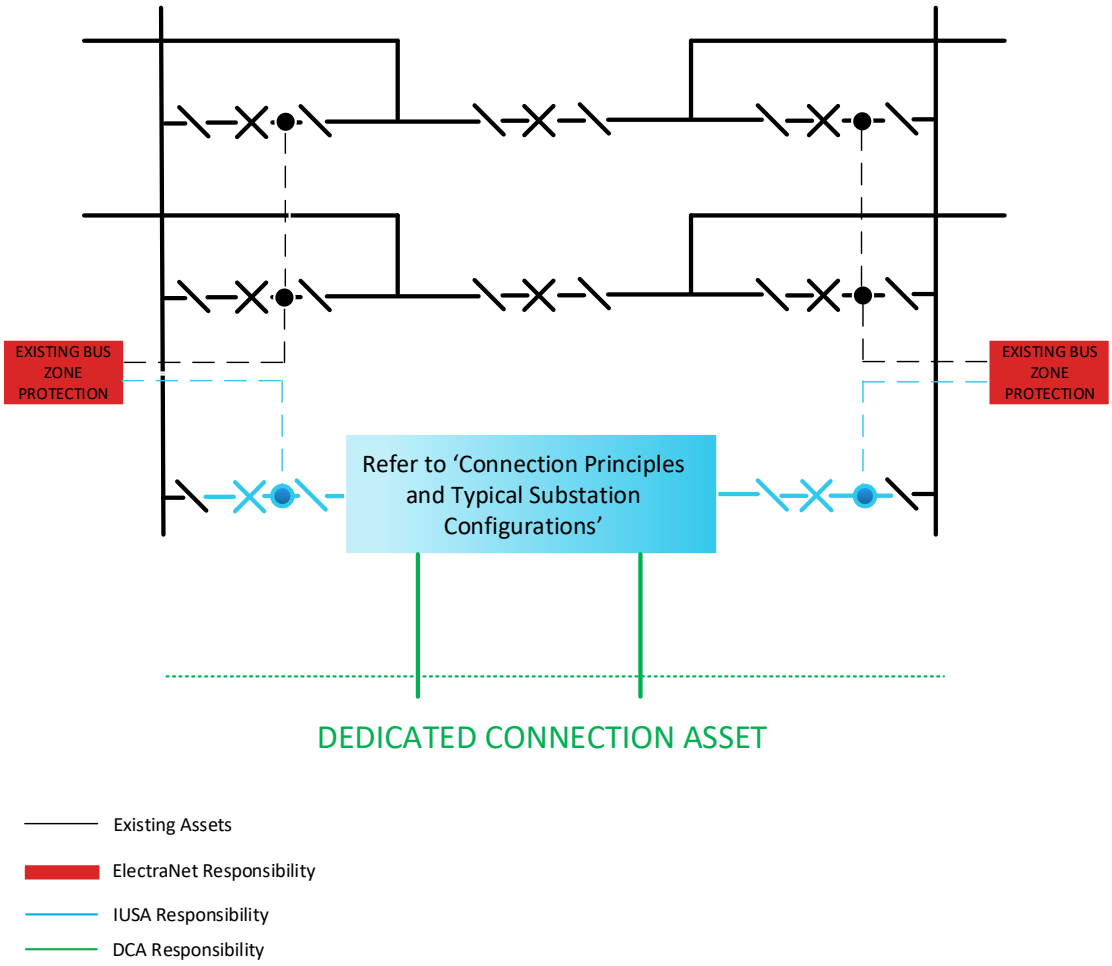

Figure 6-1 Typical Brownfield Protection Interface

6.6 National Grid Metering

NGM equipment and services must be provided as per Section 5.4. Details of the NGM scope of work as well as any interfaces will be defined in the IWA.

6.7 Data Services

It is assumed the existing site is already serviced by adequate ElectraNet telecommunications bearers and services.

If this is not the case, and any additional work is required, details of the telecommunication bearer scope of work as well as any interfaces will be defined in the IWA.

All services will be presented in ElectraNet-provided cubicles (one for the primary set of services, the other for the redundant set). These panels will be required to be housed within the IUSA control room. The panels will provide multimode fibre interfaces (for all data services) and copper interfaces (for telephony services). The IUSA Provider is responsible for cabling up to the panels and connecting to the appropriate interface port. Refer to Figure 5-3 Telecommunications and Data Interface.

The IUSA Provider must ensure there is adequate space for the panels and will provide 100VDC supplies to this panel.

Details of the services scope of work as well as any interfaces will be defined in the IWA.

6.7.1 Substation LAN

ElectraNet will supply a redundant set of switches to connect all IEDs (relays, bay controllers, etc.) to the substation LAN. The substation LAN will form the basic communication medium for all SCADA, HMI, configuration and fault data traffic. Each type of traffic will be placed onto a separate virtual LAN in accordance with its criticality, priority and traffic profile.

The IUSA Provider must also work closely with ElectraNet to define the data services interface details. A sample of the Services Details Form can be found in Appendix A.

6.7.2 SCADA

Existing SCADA Gateways and HMI system will be used in the case of brownfield sites and may be upgraded if necessary. The existing site HMI will be modified to include the local alarms controls and indications associated with the IUSA equipment.

In case of IEC 61850 based brownfield sites using peer-to-peer communication for inter-tripping within the substation, the Feeder Bay solution IEDs and Bay Control Units supplied by the IUSA Provider must use IEC61850 MMS (instead of DNP3) and GOOSE messages (instead of hard-wired) for SCADA and protection purposes respectively. ElectraNet will supply the necessary Ethernet switches to augment the existing IEC61850 LAN to connect the afore-mentioned IEDs.

Details of the SCADA scope of work as well as any interfaces will be defined in the IWA.

6.7.3 HMI

ElectraNet will supply an HMI Server and Client in the Control building for the purpose of monitoring and operator control of the substation from within the control room. Whilst the server must reside in the cubicle, the client equipment (keyboard, mouse, screen, etc.) will reside on a desk. The IUSA Provider must provide an appropriate desk for the HMI client equipment.

6.7.4 Switchgear Interlocking

The existing site interlocking scheme must be extended to include the IUSA equipment. Switchgear interlocking must comply with the requirements of 1-09-FR-14 Switchgear Interlocking. The connections into the existing interlocking scheme will be undertaken by ElectraNet.

6.7.5 Performance Monitoring

The IUSA Provider must provide ElectraNet with all relay management software, performance logging software, and other electronic interface that ElectraNet may require in order to remotely manage the configuration and performance of all IEDs on site. Software to download logs from all IEDs to monitor and manage the network and substation performance must also be provided by the IUSA Provider.

6.7.6 Security

The IUSA Provider must expand on the existing security infrastructure in accordance with ElectraNet Standards. This includes alarm systems, CCTV cameras, etc. ElectraNet will provide all ElectraNet-specific equipment including key locks, alarm panels, etc. to ensure it is compatible with existing ElectraNet systems.

Details of the security scope of work as well as any interfaces will be defined in the IWA.

6.7.7 Permissive to Close Signal

A Permissive to Close Signal must be implemented on all circuit breakers that are used to switch the DCA circuit. The objective of the Permissive to Close function is to provide ElectraNet with formal confirmation, from the DCA operator, that the DCA facility is in a state of readiness to receive a supply from ElectraNet's electricity transmission network. What constitutes the state of readiness will be determined by the DCA facility operator, but as a minimum ElectraNet would expect it to provide confirmation that all personnel are clear, and all plant & equipment within the DCA facility is in a safe condition and is ready for energisation. The implementation requirements for the Permissive to Close signal are defined within ElectraNet's suite of Functional Requirements documents.

6.8 DCA Interface

Interfaces to the DCA and the Generator / Load facility will be determined during the detailed design and included in the IWA. Potential interfaces include:

1. Earth grid;
2. Data services;
3. HV Circuit Breaker inter-trip; and
4. Protection coordination and joint commissioning activities.

7. Typical Data and Information Requirements

In addition to the technical interfaces, there are a number of non-technical interfaces that the IUSA Provider will need to be aware of when dealing with ElectraNet. Figure 7-1 below depicts the typical information flow required in order to scope, design and commission a connection point. The information takes the form of documents, drawings and records, details of which can be found in Appendix B, Appendix C and Appendix D.

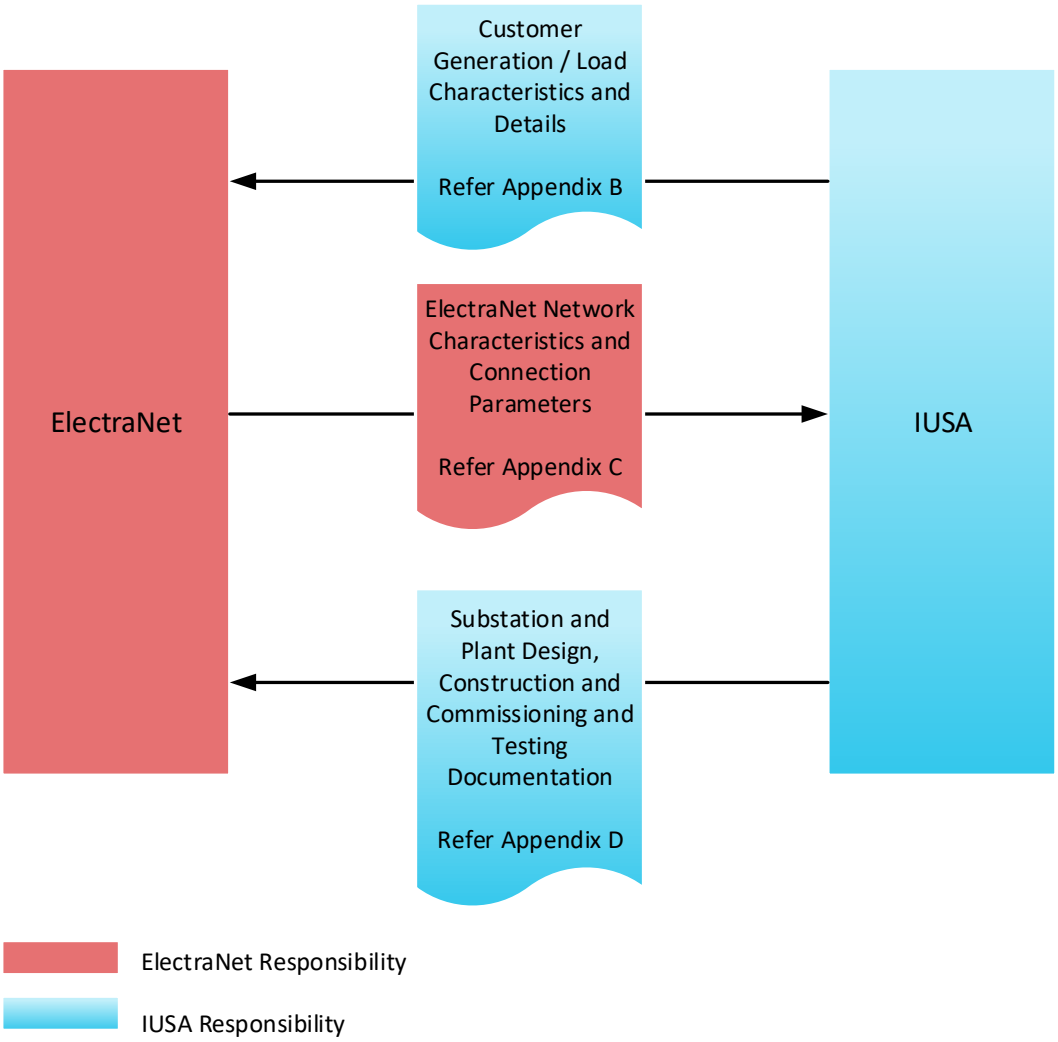

Figure 7-1 Typical Data and Information Requirements

In addition, the IUSA Provider will need to liaise with ElectraNet in order to facilitate access to outage management, drawing management, configuration management and project management systems. Particular attention needs to be given to Document 1-09--FR-33 Generic Commissioning Requirements Including Typical Timescales which provides a high level timeline of when various activities and tasks need to take place.

Appendices

Appendix A Typical Services Details Form

Building X							
SWITCH OPS-A Ports	**Device Description**	**Device Model**	**Hostname**	**IP Address**	**Subnet**	**Gateway**	**Static Route**
1 SFP	RTR-A reserved		-				
2 SFP							
3 SFP							
4 SFP							
5 SFP							
6 SFP							
7 SFP							
8 SFP							
9 SFP							
10 SFP							
11 SFP	MPS-A Uplink						
12 SFP	MPS-B Uplink						
13 GE	Set 1 Battery reserved						
14 GE	ATA-A reserved		-				
15 GE							
16 GE							
17 GE							
18 GE	HMI reserved						
19 PoE	SCADA RTU reserved						
20 PoE							
21 PoE	Temperature Probe reserved						
22 PoE	Wireless AP reserved						
SWITCH OPS-B PORTS	**Device Description**	**Device Model**	**Hostname**	**IP Address**	**Subnet**	**Gateway**	**Static Route**
1 SFP	RTR-B reserved		-				
2 SFP							
3 SFP							
4 SFP							
5 SFP							
6 SFP							
7 SFP							
8 SFP	DCN Management reserved						
9 SFP							
10 SFP							
11 SFP	MPS-A Uplink						
12 SFP	MPS-B Uplink						
13 GE	Set 2 Battery reserved						
14 GE	ATA-B reserved		-				
15 GE	PSPM/PQM reserved						
16 GE							
17 GE							
18 GE	HMI reserved						
19 PoE	SCADA RTU reserved						
20 PoE	IP Phone reserved						
21 PoE							
22 PoE	WYSE Terminal reserved						
			-				

Appendix B Typical Information required from customers for connection

Name of Project	
Location	
Type – Generation, Load or Storage	
Size in MW	
Capacity or Load Factor (as applicable)	
Plan for future expansion? If so, details thereof	
Type of fuel used for generation	
Method of Power Conversion if applicable (e.g. inverters)	
For Storage projects, Maximum Charging and Discharging MW	
Operating characteristics of the plant including generation or loading profile	
Energisation date	
Proposed location of connection to ElectraNet network including Connection voltage	
Single Line Diagram of the proposed connection arrangement	
Proposed voltage control strategy	
Modelling data as per the link	http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Network-connections/Modelling-requirements
Assessment and compliance with ESCOSA Licensing requirements	https://www.escosa.sa.gov.au/industry/electricity/licensing

Appendix C ElectraNet Network Characteristics and Connection Parameters

Minimum and Ultimate Fault levels at connection point	
Earthing requirements	
Power Quality Allocation and current power quality levels at the connection point	
Assess and endorse Voltage Control proposal	
Protection requirements including protection clearance times, auto reclose requirements	
Assessment of generator performance standards (GPS) and issue a letter as per NER clause 5.3.4	
Plant ratings and any special protection schemes or runback schemes in the vicinity of the connection point	

Appendix D Typical Substation and Plant Design, Construction, Commissioning and Testing Documentation

Project Phase	Discipline	Information Category	Document Name
Definition	Primary Plant	Report	CIRCUIT BREAKER SPECIFICATION
Definition	Primary Plant	Report	DISCONNECTOR SPECIFICATION
Definition	Primary Plant	Report	INSTRUMENT TRANSFORMER SPECIFICATION
Definition	Primary Plant	Report	SHUNT CAPACITOR SPECIFICATION
Definition	Primary Plant	Report	TRANSFORMER AND REACTOR SPECIFICATION
Definition	Primary Plant	Report	SVC SPECIFICATION
Definition	Primary Plant	Report	STATCOM SPECIFCATION
Definition	Primary Plant	Report	SERIES COMPENSATION SPECIFICATION
Definition	Primary Plant	Report	SHUNT CAPACITOR DESIGN REVIEW REPORTS
Definition	Primary Plant	Report	TRANSFORMER AND REACTOR DESIGN REVIEW REPORTS
Definition	Primary Plant	Report	SVC DESIGN REVIEW REPORTS
Definition	Primary Plant	Report	STATCOM DESIGN REVIEW REPORTS
Definition	Primary Plant	Report	SERIES COMPENSATION DESIGN REVIEW REPORTS
Definition	Primary Plant	Report	CIRCUIT BREAKER INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Report	DISCONNECTOR INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Report	INSTRUMENT TRANSFORMER INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Report	SHUNT CAPACITOR INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Report	TRANSFORMER AND REACTOR INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Report	SVC INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Report	STATCOM INSTALLATION AND MAINTENANCE MANUALS

Project Phase	Discipline	Information Category	Document Name
Definition	Primary Plant	Report	SERIES COMPENSATION INSTALLATION AND MAINTENANCE MANUALS
Definition	Primary Plant	Drawing/ Schematic	CIRCUIT BREAKER DRAWINGS
Definition	Primary Plant	Drawing/ Schematic	DISCONNECTOR DRAWINGS
Definition	Primary Plant	Drawing/ Schematic	INSTRUMENT TRANSFORMER DRAWINGS
Definition	Primary Plant	Drawing/ Schematic	SHUNT CAPACITOR DRAWINGS
Definition	Primary Plant	Drawing/ Schematic	TRANSFORMER AND REACTOR DRAWINGS
Definition	Primary Plant	Report	SVC DRAWINGS
Definition	Primary Plant	Report	STATCOM DRAWINGS
Definition	Primary Plant	Report	SERIES COMPENSATION DRAWINGS
Definition	Primary Plant	Report	CIRCUIT BREAKER PLHIA
Definition	Primary Plant	Report	DISCONNECTOR PLHIA
Definition	Primary Plant	Report	INSTRUMENT TRANSFORMER PLHIA
Definition	Primary Plant	Report	SHUNT CAPACITOR PLHIA
Definition	Primary Plant	Report	TRANSFORMER AND REACTOR PLHIA
Definition	Primary Plant	Report	SVC PLHIA
Definition	Primary Plant	Report	STATCOM PLHIA
Definition	Primary Plant	Report	SERIES COMPENSATION PLHIA
Definition	Primary Plant	Report	CIRCUIT BREAKER FACTORY TEST REPORTS
Definition	Primary Plant	Report	DISCONNECTOR FACTORY TEST REPORTS
Definition	Primary Plant	Report	INSTRUMENT TRANSFORMER FACTORY TEST REPORTS
Definition	Primary Plant	Report	SHUNT CAPACITOR FACTORY TEST REPORTS
Definition	Primary Plant	Report	TRANSFORMER AND REACTOR FACTORY TEST REPORTS
Definition	Primary Plant	Report	SVC FACTORY TEST REPORTS
Definition	Primary Plant	Report	STATCOM FACTORY TEST REPORTS

Project Phase	Discipline	Information Category	Document Name
Definition	Primary Plant	Report	SERIES COMPENSATION FACTORY TEST REPORTS
Definition	All	Report	SAFETY IN DESIGN HAZARD ID REGISTER
Definition	Substation Design	Drawing/ Schematic	SUBSTATION CONCEPT SINGLE LINE DIAGRAMS
Definition	Substation Design	Drawing/ Schematic	SUBSTATION ELECTRICAL CONCEPT DESIGN DRAWINGS
Definition	Substation Design	Drawing/ Schematic	SUBSTATION CIVIL / STRUCTURAL CONCEPT DESIGN DRAWINGS
Definition	Substation Design	Drawing/ Schematic	SUBSTATION EARTHWORKS AND FENCE CONCEPT DESIGN DRAWINGS
Definition	Substation Design	Report	INSULATION CO-ORDINATION REVIEW
Definition	Substation Design	File	INSULATION CO-ORDINATION PSCAD MODEL
Definition	Substation Design	Report	HYDROLOGY AND TOPOLOGY INVESTIGATION
Definition	Substation Design	Report	GEOTECHNICAL INVESTIGATION
Definition	Substation Design	File	EARTHING CDEGS MODEL
Definition	Substation Design	Report	EARTHING AND LIGHTNING REPORT
Definition	Substation Design	File	LIGHTNING MODEL
Definition	Substation Design	Report	SUBSTATION ENGINEERING CONTRACT SPECIFICATION
Definition	Substation Design	Report	SUBSTATION LIGHTING REPORT
Definition	Protection Design	Drawing/ Schematic	PROTECTION CONCEPT SINGLE LINE DIAGRAMS
Definition	Metering Design	Drawing/ Schematic	NGM CONCEPT SINGLE LINE DIAGRAMS
Definition	Automation Design	Drawing/ Schematic	AUTOMATION CONCEPT SINGLE LINE DIAGRAMS
Definition	Protection Design	Report	PROTECTION, METERING, AUTOMATION ENGINEERING CONTRACT SPECIFICATION
Definition	Telecommunications Design	Drawing/ Schematic	TELECOMUNICATION CONCEPT SINGLE LINE DIAGRAMS
Definition	Telecommunications Design	Drawing/ Schematic	TELECOMUNCATIONS CIVIL / STRUCTURAL CONCEPT DESIGN DRAWINGS

Project Phase	Discipline	Information Category	Document Name
Definition	Telecommunications Design	Drawing/ Schematic	TELECOMUNICATIONS EARTHWORKS AND FENCE CONCEPT DESIGN DRAWINGS
Definition	Telecommunications Design	File	TELECOMUNICATIONS SITE EARTHING CDEGS MODEL
Definition	Telecommunications Design	Report	TELECOMUNICATIONS SITE EARTHING AND LIGHTNING REPORT
Definition	Telecommunications Design	File	LIGHTNING MODEL
Definition	Telecommunications Design	File	TELECOMUNICATIONS ENGINEERING CONTRACT SPECIFICATION
Execution	Primary Plant	Report	CIRCUIT BREAKER SITE TEST REPORTS
Execution	Primary Plant	Report	DISCONNECTOR SITE TEST REPORTS
Execution	Primary Plant	Report	INSTRUMENT TRANSFORMER SITE TEST REPORTS
Execution	Primary Plant	Report	SHUNT CAPACITOR SITE TEST REPORTS
Execution	Primary Plant	Report	TRANSFORMER AND REACTOR SITE TEST REPORTS
Execution	Primary Plant	Report	TRANSFORMER AND REACTOR OIL TEST REPORTS
Execution	Primary Plant	Report	SVC SITE TEST REPORTS
Execution	Primary Plant	Report	STATCOM P SITE TEST REPORTS
Execution	Primary Plant	Report	SERIES COMPENSATION SITE TEST REPORTS
Execution	Primary Plant	Report	PLANT RATING INFORMATION
Execution	Primary Plant	Drawing/ Schematic	TRANSFORMER CONDITION MONITORING SYSTEM DETAIL DESIGN DRAWINGS
Execution	Primary Plant	Drawing/ Schematic	CB CONDITION MONITORING SYSTEM DETAIL DESIGN DRAWINGS
Execution	Primary Plant	Drawing/ Schematic	INSTRUMENT TRANSDFORMER CONDITION MONITORING SYSTEM DETAIL DESIGN DRAWINGS
Execution	Primary Plant	Drawing/ Schematic	TRANSFORMER CONDITION MONITORING SYSTEM INSTALLATION AND MAINTENANCE MANUALS

Project Phase	Discipline	Information Category	Document Name
Execution	Primary Plant	Drawing/ Schematic	CB CONDITION MONITORING SYSTEM INSTALLATION AND MAINTENANCE MANUALS
Execution	Primary Plant	Drawing/ Schematic	INSTRUMENT TRANSDFORMER MONITORING SYSTEM INSTALLATION AND MAINTENANCE MANUALS
Execution	Primary Plant	Drawing/ Schematic	WEATHER STATIONS DETAIL DESIGN DRAWINGS
Execution	Primary Plant	Drawing/ Schematic	WEATHER STATIONS INSTALLATION AND MAINTENANCE MANUALS
Execution	Primary Plant	Drawing/ Schematic	POLUTION MONITORS DETAIL DESIGN DRAWINGS
Execution	Primary Plant	Drawing/ Schematic	POLUTION MONITORS INSTALLATION AND MAINTENANCE MANUALS
Execution	Primary Plant	Drawing/ Schematic	DYNAMIC LINE RATING DETAIL DESIGN DRAWINGS
Execution	Primary Plant	Drawing/ Schematic	DYNAMIC LINE RATING INSTALLATION AND MAINTENANCE MANUALS
Execution	Primary Plant	Report	CB OPERATOR HANDBOOKS
Execution	Primary Plant	Report	DISCONNECTOR AND EARTH SWITCH OPERATOR HANDBOOKS
Execution	Primary Plant	Report	TRANSFORMER CONTROLS OPERATOR HANDBOOKS
Execution	Primary Plant	Report	REACTOR CONTROLS OPERATOR HANDBOOKS
Execution	Primary Plant	Report	CAP BANK OPERATOR HANDBOOKS
Execution	Primary Plant	Report	SVC OPERATOR HANDBOOKS
Execution	Primary Plant	Report	STATCOM OPERATOR HANDBOOKS
Execution	Primary Plant	Report	SERIES COMPENSATION OPERATOR HANDBOOKS
Execution	Primary Plant	Report	SPECIAL PLANT OPERATOR HANDBOOKS
Execution	Primary Plant	Report	CB MONITORING SYSTEMS OPERATOR HANDBOOKS
Execution	Primary Plant	Report	TRANSFORMER MONITORING SYSTEMS OPERATOR HANDBOOKS
Execution	Primary Plant	Report	REACTOR MONITORING SYSTEMS OPERATOR HANDBOOKS

Project Phase	Discipline	Information Category	Document Name
Execution	Primary Plant	Report	WEATHER STATIONS, POLUTION MONITORS AND DYNAMIC LINE RATING OPERATOR HANDBOOKS
Execution	Substation Design	Report	SUBSTATION FIRE RISK ASSESSMENT REPORT
Execution	Substation Design	Drawing/ Schematic	SUBSTATION ELECTRICAL DETAIL DESIGN DRAWINGS
Execution	Substation Design	Drawing/ Schematic	SUBSTATION CIVIL / STRUCTURAL DETAIL DESIGN DRAWINGS
Execution	Substation Design	Report	SUBSTATION CIVIL / STRUCTURAL BCA CERTIFICATION REPORTS
Execution	Substation Design	Drawing/ Schematic	SUBSTATION EARTHWORKS AND FENCE DETAIL DESIGN DRAWINGS
Execution	Substation Design	Drawing/ Schematic	SUBSTATION AS BUILT DRAWINGS
Execution	Substation Design	File	SUBSTATION-CABLES CYMCAP MODELS
Execution	Substation Design	Report	ACCESS AND SECURITY SYSTEMS OPERATOR HANDBOOKS
Execution	Substation Design	Report	FIRE SUPPRESION AND DETECTION SYSTEMS OPERATOR HANDBOOKS
Execution	Substation Design	Report	400V AC CHANGE-OVER OPERATOR HANDBOOKS
Execution	Substation Design	Report	DIESEL GENERATOR OPERATOR HANDBOOKS
Execution	Substation Design	Report	OIL / WATER SYSTEMS OPERATOR HANDBOOKS
Execution	Protection Design	Drawing/ Schematic	PROTECTION DESIGN PHILOSOPHY REPORTS
Execution	Protection Design	Drawing/ Schematic	PROTECTION SETTINGS REPORTS
Execution	Protection Design	Drawing/ Schematic	PROTECTION RELAY/SCHEME FACTORY ACCEPTANCE REPORTS
Execution	Protection Design	Drawing/ Schematic	PROTECTION RELAY/SCHEME INSTALLATION AND MAINTENANCE MANUALS
Execution	Protection Design	Drawing/ Schematic	PROTECTION SCHEME DETAIL DESIGN DRAWINGS
Execution	Protection Design	Drawing/ Schematic	PROTECTION RELAY/SCHEME SITE ACCEPTANCE REPORTS

Project Phase	Discipline	Information Category	Document Name
Execution	Protection Design	Drawing/ Schematic	PROTECTION SCHEME AS BUILT DRAWINGS
Execution	Protection Design	Report	PROTECTION SCHEMES OPERATOR HANDBOOKS
Execution	Protection Design	Report	AUTOMATIC VOLTAGE REGULATION SCHEMES OPERATOR HANDBOOKS
Execution	Protection Design	Report	UNDER FREQUENCY LOAD SHEDDING SCHEMES OPERATOR HANDBOOKS
Execution	Protection Design	Report	UNDER VOLTAGE LOAD SHEDDING SCHEMES OPERATOR HANDBOOKS
Execution	Protection Design	Report	RUN-BACK SCHEMES OPERATOR HANDBOOKS
Execution	Protection Design	Report	PSPM OPERATOR HANDBOOKS
Execution	Protection Design	Report	TWS OPERATOR HANDBOOKS
Execution	Protection Design	Report	PQM OPERATOR HANDBOOKS
Execution	Protection Design	Drawing/ Schematic	SECURITY SYSTEMS AND FIRE PROTECTION SYSTEMS DRAWINGS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (TWS, PSPM, PQM) DETAIL DESIGN DRAWINGS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (TWS, PSPM, PQM) SETTINGS REPORTS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (TWS, PSPM, PQM) FACTORY ACCEPTANCE REPORTS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (TWS, PSPM, PQM) INSTALLATION AND MAINTENANCE MANUALS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (TWS, PSPM, PQM) SITE ACCEPTANCE REPORTS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (TWS, PSPM, PQM) AS BUILT DRAWINGS
Execution	Protection Design	Drawing/ Schematic	POWER SYSTEM MONITORING (PQM) CALIBRATION CERTIFICATES
Execution	Metering Design	Drawing/ Schematic	NGM CONFIGURATION REPORTS
Execution	Metering Design	Drawing/ Schematic	NGM METER CALIBRATION CERTIFICATES

Project Phase	Discipline	Information Category	Document Name
Execution	Metering Design	Drawing/ Schematic	NGM CT/VT CALIBRATION CERTIFICATES
Execution	Metering Design	Drawing/ Schematic	ENERGY METER INSTALLATION AND MAINTENANCE MANUALS
Execution	Metering Design	Drawing/ Schematic	NGM SCHEME DETAIL DESIGN DRAWINGS
Execution	Metering Design	Drawing/ Schematic	NGM SCHEME AS BUILT DRAWINGS
Execution	Metering Design	Drawing/ Schematic	NGM CONNECTION POINT REISTRATION REQUIRMENTS F4120
Execution	Metering Design	Drawing/ Schematic	NGM CHECKLIST F4117
Execution	Metering Design	Drawing/ Schematic	NGM CONNECTION POINT REGISTRATION FORM F4118
Execution	Automation Design	Report	AUTOMATION-CONTROL SYSTEM PHILOSOPHY REPORT
Execution	Automation Design	Drawing/ Schematic	AUTOMATION CONFIGURATION REPORTS
Execution	Automation Design	Drawing/ Schematic	AUTOMATION DETAIL DESIGN DRAWINGS
Execution	Automation Design	Drawing/ Schematic	AUTOMATION EQUIPMENT SITE ACCEPTANCE REPORTS
Execution	Automation Design	Drawing/ Schematic	AUTOMATION EQUIPMENT INSTALLATION AND MAINTENANCE MANUALS
Execution	Automation Design	Report	HMI OPERATOR HANDBOOK
Execution	Automation Design	Report	LCF OPERATOR HANDBOOK
Execution	Automation Design	Drawing/ Schematic	AUTOMATION AS BUILT DRAWINGS
Execution	Automation Design	Drawing/ Schematic	AUTOMATION LIST OF CONTROL, INDICATIONS & ALARMS
Execution	Telecommunications Design	Drawing/ Schematic	TELECOMUNICATIONS DETAIL DESIGN DRAWINGS
Execution	Telecommunications Design	Report	TELECOMUNICATIONS SYSTEMS OPERATOR HANDBOOKS
Execution	Telecommunications Design	Drawing/ Schematic	TELECOMUNICATIONS EQUIPMENT INSTALLATION AND MAINTENANCE MANUALS

Project Phase	Discipline	Information Category	Document Name
Execution	Telecommunications Design	Drawing/ Schematic	TELECOMUNCATIONS CIVIL / STRUCTURAL DETAIL DESIGN DRAWINGS
Execution	Telecommunications Design	Drawing/ Schematic	TELECOMUNCATIONS CIVIL / STRUCTURAL BCA CERTIFICATION REPORT
Execution	Telecommunications Design	Drawing/ Schematic	TELECOMUNICATIONS EARTHWORKS AND FENCE DETAIL DESIGN DRAWINGS
Execution	Telecommunications Design	Drawing/ Schematic	TELECOMUNICATIONS AS BUILT DRAWINGS
Execution	Telecommunications Design	Report	TELECOMUNICATIONS EQUIPMENT FACTORY ACCEPTANCE TEST REPORTS
Execution	Telecommunications Design	Report	TELECOMUNICATIONS EQUIPMENT SITE ACCEPTANCE TEST REPORTS
Execution	Telecommunications Design	Files	TELECOMUNICATIONS POLES AND TOWERS PLSCAD AND PLSPOLE MODELS
Execution	Telecommunications Design	Drawing/ Schematic	OPSWAN DIAGRAMS
Execution	Telecommunications Design	Report	OPSWAN OPERATOR HANDBOOK
Execution	All	Report	SAFETY IN DESIGN REPORT
Execution	All	Report	REQUESTS TO ENERGISE
Execution	All	Report	ENVIRONMENTAL MANAGEMENT PLANS
Execution	All	Report	EPA REPORTS
Execution	All	Report	SITE EMF TEST REPORTS
Execution	All	Report	SITE RADIATION REPORTS
Execution	All	Report	SITE SPARES REPORTS
Execution	All	Report	WARANTY MANAGEMENT PLANS

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