Company Manual

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CEOM7621.01 TECHNOLOGY GUIDELINE: PLACES IN THE NETWORK

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1.0 PURPOSE

The Essential Energy Asset Management division provides Telecommunication infrastructure services to many different office types and locations in support of business services. This document is intended to be used by the Business Stakeholders and the Telecommunications group to provide clarity around those locations and the types of Telecommunications & Infrastructure services that will be supported at each location type. This document will also provide a high level architecture for each site type.

2.0 SCOPE

Adherence with this guideline will facilitate:

- a common and consistent approach to the delivery of Telecommunications Infrastructure services;
- reduced Total Cost of Ownership through the consistent and repeatable delivery of technology services;
- a more efficient design and provision process for Telecommunications & Property personnel; and
- set expectations on the availability parameters for each site type with the business.

3.0 REFERENCES

Internal
Company Manual (Governance) Asset Management Plan: Telecommunication Equipment-CEOM8018.07
Individual site classifications – located at http://ipplan:8008/ce_telecomsv2
ANNEXURE A – Zone Substation Classification Methodology

External
Nil entry

4.0 DEFINITIONS

For the purposes of this manual the following definitions will be applicable:

Term	Definition
10 X 5	Service coverage equivalent to extended business hours. Generally, Monday – Friday, 7am to 5pm. Excludes holidays
24 X 7	Service coverage of 24 hours per day, 7 days per week. Includes public holidays
3G	3rd Generation
4G	4th generation – Often referred to as Long Term Evolution (LTE)
DA	Distribution Automation
DC	Direct Current
DR	Disaster Recovery
EoL	End of Life
ESC	Essential Service Centre
ICT	Information Communication and Technology
IP	Internet Protocol
LAN	Local Area Network
PC	Personal Computer
QoS	Quality of Service

RF	Radio Frequency
SCADA	Supervisory Control and Data Acquisition
SLA	Service Level Agreement
UPS	Uninterruptable Power Supply
WAN	Wide Area Network

Baseline
Transmission technology that is current and in wide use within Essential Energy.

Emerging
Transmission technology that is for future use or in testing or early adoption stages within Essential Energy.

Recordkeeping
Making and maintaining complete, accurate and reliable evidence of business transactions in the form of recorded information (Source: AS records classification handbook – HB5031 – 2011.).

Retirement
Transmission technology that is currently in use within Essential Energy and will be supported to asset End of Life (EoL), but no further deployments allowed.

Review date
The review date displayed in the header of the document is the future date for review of this document. The default period is three years from the date of approval however a review may be mandated at any time where a need is identified due to changes in legislation, organisational changes, restructures, occurrence of an incident or change in technology or work practice. 2 years from date of approval.

Virtualisation
Partitions a network into multiple logical networks, each with unique attributes such as routing, switching, security, bandwidth, etc. whilst utilising common hardware. The most common example of this in Essential Energy is the logical separation of our Corporate and Supervisory Control and Data Acquisition (SCADA) Wide Area Network (WAN) networks whilst still utilising common hardware.

5.0 ACTIONS

To ensure compliance with this guideline the following governance shall be implemented:

- all new corporate locations, e.g. Depot, Corporate offices, will be classified by the Telecommunications Architect prior to any Architecture or Design being undertaken. Any site that is being moved or relocated but maintains the same functionality does not require reclassification;

- all network specific locations, e.g. Zone Sub Stations, will be classified by Asset Management or Network Services prior to any Architecture or Design work being undertaken;

- new WAN service technologies not listed in **Table 5** must be evaluated and classified by the Telecommunications Architect prior to them being included in agreed service types; and

a waiver must be submitted for approval by the Telecommunications Architect should there be a justified business case for architecture to be provisioned outside of the parameters described in this guideline.

5.1 Site Classification Definitions

5.1.1 Data Centre

Central

Central Data Centres are a purpose-built facility designed to maximise the security and availability of Essential Energy's ICT & Telecommunications assets. Central Data Centres house the vast majority of Essential Energy's server and storage infrastructure as well as being the interconnection point for any external third party remote access. At the time of writing this document Essential Energy operates 3 Central Data Centres in a production/DR configuration.

Regional

Regional Data Centres are a purpose-built room designed to provide a secure and reliable facility for Essential Energy's ICT & Telecommunications assets. Regional Data Centres house a small quantity of server and storage systems along with significant Telecommunications assets designed to support local operations. At the time of writing this document Essential Energy operates 2 Regional Data Centres in a non-redundant format.

5.1.2 Corporate Office/Depot

Type 1
Greater than 150 PC end points

Type 2
Provides one or more Private Mobile Radio channel interconnections independent of the number of PC end points

Type 3
Less than 150 and greater than 20 PC end points

Type 4
Less than 20 PC end points

Type 5
Provides dedicated functionality in support of any of the following:

- Network Operators;
- Network Operations Technical Officers;
- Supply Interruptions Group; and
- Customer Service Agents.

5.1.3 Zone Sub Station

Zone Substations are classified by the Asset Management and Network Services divisions based on criteria as defined by them, detailed in Annexure A. It has been agreed that there will be 4 site types and these classifications will reflect the criticality of sites and the role they play in the electrical network. Supported services and the availability of Telecommunications infrastructure for these locations is based on the agreed SLA's for each site type as detailed in Table 1 & 2.

5.1.4 Radio site

Hub

A radio hub site provides supporting infrastructure for the interconnection of other radio hub, SCADA endpoints or voice radio end point sites. It will have more than one link for the interconnection of other locations. This site may or may not have a base station for the direct communication with field vehicles.

End Point

A voice radio end point has only one interconnecting link to a hub site and must have a voice base station for direct communication with field vehicles.

5.2 Architectural Requirements

5.2.1 General

- Minimum bandwidth estimation based on 65Kb/s per standard user.

- Due to the complexity of the Essential Energy data network it is common practice to have sites interconnect via other locations as part of the WAN path, including radio sites. When this is the case all sites in the WAN path must meet the minimum requirements for the highest rating site.

5.2.2 Data Centre

5.2.2.1 Central

Telecommunications

Requires a fully diverse path through access, distribution, and WAN layers, including carrier services, routers, and switches. Both the primary and diverse WAN paths must be of an equal capability, grade A service. As there are no permanent users at these locations then bandwidth requirements will be determined by the Telecommunications Architect and based on application requirements, but as a general rule bandwidth will not be less than 200Mb/s.

Facilities

The facilities housing the Data centre must meet the Uptime Institute rating of Tier III as a minimum. This provides for an average SLA resulting in system availability of 99.98% (1.6 hours per annum unavailable). The size and type of dedicated facility will be determined on a case by case basis by the ICT & Telecommunications management team.

5.2.2.2 Regional

Telecommunications

Must have a fully diverse path from access through the distribution layer to the WAN, includes carrier services, routers, switches etc. Both the primary and diverse WAN paths must be of an equal capability, grade A service. As there are no permanent users at these locations then bandwidth requirements will be determined by the Telecommunications Architect and based on application requirements, but as a general rule bandwidth will not be less than 100Mb/s.

Facilities

The facilities housing the Data centre should meet the Uptime Institute rating of Tier II as a minimum. This provides for an average SLA resulting in system availability of 99.75% (22 hours per annum unavailable). The size and type of dedicated room will be determined on a case by case basis by the ICT & Telecommunications management team.

5.2.3 Corporate Office/Depot

5.2.3.1 General

Offices and depots co-located or adjacent to Zone Substations or Bulk Supply Points operated by Essential Energy or other parties may be subject to Earth Potential Rise. Designers must consider additional requirements that apply to sites where EPR is a risk and may need to have an Earthing Study undertaken. Where EPR risk cannot be mitigated, carrier services utilising conductive wire (e.g. ADSL) are to be considered unsuitable.

5.2.3.2 Type 1

Telecommunications

Single path is required for the access layer, but must have a fully diverse path from distribution layer to the WAN, includes carrier services, routers, switches etc. Both the primary and diverse WAN paths must be of an equal capability, grade A service.

Facilities

A dedicated Communications room with minimum measurements of 3m X 3m is required. The communications room must be secured from unauthorised access and air conditioned to an appropriate level to maintain stable environmental conditions at all times. All Telecommunications equipment is to have power fed from a UPS capable of providing a minimum of 4 hours of autonomous power or otherwise a generator.

5.2.3.3 Type 2

Telecommunications

Single path is required for the access and distribution layers, but the site must have redundant WAN services. Redundant WAN services must be of equal capability grade A services.

Facilities

A dedicated Communications room with minimum measurements of 3m X 3m is required. The communications room must be secured from unauthorised access and air conditioned to an appropriate level to maintain stable environmental conditions at all times. All Telecommunications equipment is to have power fed from a UPS capable of providing a minimum of 4 hours of autonomous power.

5.2.2.4 Type 3

Telecommunications

Single path is required for the access, distribution and WAN layers. The single WAN service must be a Grade A service.

Facilities

A dedicated Communications room with minimum measurements of 3m X 3m is required. The communications room must be secured from unauthorised access and air conditioned to an appropriate level to maintain stable environmental conditions at all times. All Telecommunications equipment is to have power fed from a UPS capable of providing a minimum of 1 hour of autonomous power.

5.2.2.5 Type 4

Telecommunications

Single path is required for all access, distribution and WAN layers. The WAN service may be a grade B service.

Facilities

A dedicated 32 RU rack is required. The rack must be located in an area that is secured from unauthorised access and the location of the rack should be positioned to maximise environment stability. All Telecommunications equipment is to have power fed from a UPS capable of providing up to 15 minutes of autonomous power.

5.2.2.6 Type 5

Telecommunications

Must have a fully diverse path for the access, distribution, and WAN layers, includes carrier services, routers, switches etc. Both the primary and diverse WAN paths must be of an equal capability, grade A service.

Facilities

A dedicated Communications room with minimum measurements of 3m X 3m is required. The room must be secured from unauthorised access and air conditioned to an appropriate level to maintain stable environmental conditions within the room. All Telecommunications equipment is to have power fed from a UPS/Generator configuration capable of providing continuous autonomous power.

5.2.4 Zone Sub Station

5.2.4.1 Type 1

Telecommunications

In support of defined critical services a fully diverse path from the access layer through the distribution layer to the WAN, including carrier services, routers, switches, etc, must be provided. Both paths must be of equal capability with both WAN services being a grade A service.

Non critical services will utilise the fully diverse WAN environment, but access and distribution layers may have single points of failure.

The Zone Sub Station must have a desktop IP telephone and a Two Way radio.

Facilities

A dedicated 42 RU 19” rack within the control room is required. All power utilised for telecommunications equipment will be DC based and may be provisioned from the SCADA DC distribution system via redundant paths.

5.2.4.2 Type 2

Telecommunications

In support of defined critical services a single connection to the access layer is sufficient, but the path through the access and distribution layer must be diverse. Redundant WAN services are required, including the WAN edge device (Router, Switch), i.e. there must be a diverse path through the hardware devices to the WAN edge. The diverse path for both the access and distribution layers must be of an equal capability. The primary WAN service must be a grade B service or higher, whilst the secondary can be a C service or higher.

Non critical services will not utilise the fully diverse WAN environment and will not be supported on the redundant path, access, distribution, and WAN layers may have single points of failure.

The Zone Sub Station must have either a desktop IP or 3G telephone and a Two-Way radio.

Facilities

A 19” rack of sufficient capacity within the control room is required. This rack is to be dedicated for telecommunications and/or SCADA equipment. All power utilised for telecommunications equipment will be DC and may be provisioned from the SCADA DC distribution system. The power infrastructure must be capable of maintaining a minimum 4 hours of autonomous operation.

5.2.4.3 Type 3

Telecommunications

Single path is required for the access, distribution and WAN layers. The single WAN service must be a grade B service. Support for critical and non-critical services is required.

The Zone Sub Station must have a desktop IP or 3G telephone and a Two-Way radio.

Facilities

A 19” rack of sufficient capacity within the control room is required. This rack is to be dedicated for telecommunications and/or SCADA equipment. All power utilised for telecommunications equipment will be DC and may be provisioned from the SCADA DC distribution system. The power infrastructure must be capable of maintaining a minimum 4 hours of autonomous operation.

5.2.4.4 Type 4

Telecommunications

Single path is required for the access, distribution and WAN layers. The single WAN service can be a grade C service. Support for critical services only is required.

The Zone Sub Station must have a desktop 3G telephone and Two Way radio when the site facilities are suitable.

Facilities

Due to the nature of these sites it is not feasible to set guidelines as they often do not have a control room. Designs will have to be created on a best effort basis whilst taking into consideration the SLA.

5.2.5 Radio Site

5.2.5.1 Hub

IP based data services are not currently provided to radio hub sites in support of Two Way Voice services however may exist where in support of SCADA. It is envisaged that infrastructure of this nature that aggregate all existing services may become common place in the near future and should be considered when designing solutions. Any hub site that forms part of the WAN path must meet the minimum service level requirements for the highest rated location utilising that site. Hub sites should have remote monitoring capability for power and environmental conditions.

5.2.5.2 End Point

IP based data services are not currently provided to voice radio end points in support of Two Way Voice or WAN services.

5.3 Site & Category Performance Characteristics

The percentage availability service level is measured as a two stage process.

1. Each individual site is categorised into a site type as shown in Table 2. The site availability percentage as detailed in Table 1 is the service level target for each individual site in that site type.
2. The second component in the service level measurement is the site type availability. This percentage determines the target for the number of sites within each site type that meets the site availability SLA.

Service Level	Site Availability %	Site Type Avail. %	Downtime	SLA coverage 24 X 7/10 X 5			Backup Power		
				Corporate	Zone Substation	Voice Radio	Corporate	Zone Substation	Voice Radio
Critical	99.95	100	22	24 X 7	24 X 7	N/A	Continuous	8 Hours	N/A
High	99.9	97	43	24 X 7	N/A	N/A	4 Hours	N/A	N/A
Medium	99.4	94	259	10 X 5	24 X 7	24 X 7	1 Hour	4 Hours	24 Hours*
Low	96	94	1724	10 X 5	10 X 5	10 X 5	<1 Hour	<1 Hour	24 Hours*
Best Effort	93	94	3024	10 X 5	10 X 5	N/A	N/A	Nil	N/A

Table 1: Service Level parameters

Site Type	Service Level	Access Path	Access Layer (Hardware)	Minimum WAN Path	WAN Layer (Hardware)
Corporate					
Data Centre - Central	Critical	Diverse	Diverse	Diverse A/A	Diverse
Data Centre - Regional	Critical	Diverse	Diverse	Diverse A/A	Diverse
Office/Depot Site type 1	High	Diverse	Single	Diverse A/A	Diverse
Office/Depot Site type 2	High	Diverse	Single	Diverse A/A	Diverse
Office/Depot Site type 3	Medium	Single	Single	Single A	Single
Office/Depot Site type 4	Low	Single	Single	Single C	Single
Office/Depot Site type 5	Critical	Diverse	Diverse	Diverse A/A	Diverse
Zone Substation					
Zone Substation type 1	Critical	Diverse	Diverse	Diverse A/A	Diverse
Zone Substation type 2	Medium	Diverse	Single	Diverse B/C	Diverse
Zone Substation type 3	Low	Single	Single	Single B	Single
Zone Substation type 4	Best Effort	Single	Single	Single C	Single
Voice Radio					
Hub Radio Site	Medium	N/A	N/A	N/A	N/A
Voice Radio Site End Point	Low	N/A	N/A	N/A	N/A

Table 2: Site service levels

* Applies to vehicle-vehicle communications only

5.4 Telecommunication Services – Availability

The table below outlines supported Telecommunication services and Service Levels for each.

IT/OT	Service	Service Component	Availability %	Backup Power
IT	Telephony	Core Telephony	99.95	Continuous
		Contact Centre features – Call queuing, routing, avalanche management, etc.	99.95	Continuous
		Call Recording	99.9	Continuous
		Individual handsets	Best Effort	N/A
		Site functionality	Ref Table 2	
	Corporate Data Network	Wired LAN - site	Ref Table 2	
		Wired LAN - Individual	Best Effort	N/A
		Wireless LAN - core	99.95	Continuous
		Wireless LAN – individual access point	Best Effort	N/A
		WAN access	Ref Table 2	
		Core Systems – Data Centre	99.95	Continuous
	Video Conferencing	Core System	99.9	Continuous
		End Point	Best Effort	N/A
OT	Protection	Unit	99	8 Hours
		Scheme	99.9	8 Hours
	SCADA	Server / FEP	99.9	Continuous
		RTU	Ref Table 2	

5.5 WAN performance characteristics

The table below provides detail of the technical performance parameters used to discriminate between a grade A or B transmission service. This table is a guide only and all new transmission services not listed in Table 5: Existing WAN technology examples, must be classified by the Telecommunications Architect.

ServiceType	Symmetrical	Latency	Jitter	Quality of Service	SLA	Contention	WAN Path	Protocols
Grade A	Yes	<80ms	<40ms	Minimum 6 Levels	>99.5%	Zero	1Mbps – 10Gbps	IP
Grade B	Not required	<150ms	<80ms	Not required	>98%	Max 3 endpoints	120k minimum	IP
Grade C	Not required	<750ms	Not specified	Not required	>90% desirable	Allowed	80k minimum	IP

Table 3: WAN performance characteristics

5.6 Application performance requirements

Application / Traffic Type	Bandwidth	Latency	Security	Critical/Non critical	Virtualisation (VPN name)
Protection	<64Kbits	<100ms total	Very high	Critical	N/A
SCADA	<64Kbits	<150ms	Very High	Critical	SCADA
Mobile workforce	<1Mbit	<500ms	High	Non-Critical	Corporate
Smart Metering Access - Core Network	>1Mbit	<150ms	High	Non-Critical	TBD
Smart Metering Access - WAN	<1Mbit	<500ms	High	Non-Critical	TBD
Smart Metering Access - Last Mile	<256Kbits	>500ms	Medium	Non-critical	TBD
Operations / Engineering data	<256Kbits	<500ms	High	Non-critical	TBD
Smart Grid Access - Core Network	>1Mbit	<150ms	Very high	Critical	DA (Recloser)
Smart Grid Access - WAN	<1Mbit	<150ms	Very high	Critical	DA (Recloser)
Smart Grid Access - Last Mile	<256Kbits	<500ms	Medium	Non-critical	DA (Recloser)
Video surveillance	<1Mbit	<500ms	High	Non-critical	Corporate
Enterprise (corporate) data	<1Mbit	<500ms	Medium	Non-critical	Corporate
Enterprise (corporate) voice	<256Kbits	<150ms	Very high	Non-critical	Corporate

Table 4: Application performance requirements

Note: Bandwidth, latency, and security levels provided above are indicative only and may well change on a case by case basis. Designers will need to be very aware of any business requirements and design accordingly.

5.7 WAN Technology examples

Technology	Service Type	Status	Note
Telstra IPWAN	A	Baseline	Includes GWIP services – Available in varying bandwidths from 2Mbps upward
SOUL DDE	A	Baseline	Available in varying bandwidths from 2Mbps upward
Essential Energy Fibre	A	Baseline	
Microwave	A	Baseline	Technology is suitable as grade A. but must be designed to meet appropriate parameters
Wimax	A	Emerging	Currently a grade A service but not used in EE as yet. Rollouts of this technology will have to be evaluated on a case by case basis to determine if it still qualifies as grade A service
ADSL/ADSL 2 +	B	Baseline	
3G	C	Baseline	Classified as grade C service as no SLA is offered
4G	C	Emerging	Classified as grade C service as no SLA is offered – This may change as negotiations with Telstra continue
Medium bandwidth digital radio (120k to 2Mb) multipoint	B	Baseline	Meets all grade B parameters, however multipoint solutions are not to exceed 2 end sites and 1 hub site.
Medium bandwidth digital radio (120k to 2Mb) multipoint > 3 sites	C	Baseline	Multipoint solution maximum 5 end sites.
Narrowband radio (< 80kb)	C	Baseline	Must meet minimum 64kb bandwidth. Medium bandwidth service is preferable. Trio radios and services less than 64k must be phased out.
Telstra DDS	A	Retirement	Meets all Grade A requirements so long as suitable bandwidths are commissioned
ISDN	B	Retirement	
Satellite	A	Baseline	Based on Telstra offering. Currently 512Kbps shared between end points
900 Mhz Radio Mesh	C	Emerging	High latency, low bandwidth, no QoS

Table 5: Existing WAN technology examples

6.0 RECORDKEEPING

The table below identifies the types of records relating to the process, their storage location and retention period.

Type of Record	Storage Location	Retention Period*
Design Work pack	Telecommunications SharePoint Site	Retain minimum of 7 years after system is superseded, either through upgrade or major modification, and any data supported is migrated or destroyed, then destroy GA28 20.4.1

* Content Coordinator must liaise with the Records Management Team to validate the retention period is compliant with the relevant disposal authority.

7.0 REVISIONS

Issue No.	Section	Details of changes in this revision	Change Risk Impact?

8.0 AUTHORITIES AND RESPONSIBILITIES

Manager Telecommunications has the authority and responsibility for approving this document.

Telecommunications Architect has the authority and responsibility for:

- reviewing this document;
- evaluating WAN service classifications; and
- approving deviations from this document.

Telecommunications Design and Delivery Manager has the authority and responsibility for reviewing this document.

Manager IT Service Management (ICT) has the authority and responsibility for endorsing this document.

Property Portfolio Manager has the authority and responsibility for endorsing this document.

9.0 DOCUMENT CONTROL

Content Coordinator : Manager Telecommunications Strategy, Planning & Governance

Distribution Coordinator : GRC Process Coordinator

ANNEXURE A – Zone Substation Classification Methodology

The Telecommunication requirements for zone substations are based on the installed transformer capacity of the zone substation. This was chosen over other measures as it represents a direct correlation with the number of customers or amount of load served by a particular substation.
For switching stations and voltage regulation stations the upstream installed capacity or installed equipment capacity can be used to achieve the same result. For switching stations with manually operated switches and no other monitoring equipment there is no immediate call for communications equipment to be installed.
Sites in which AEMO have declared an interest are ranked in the highest category, these include large embedded generators and parts of the sub transmission network that form a backup transmission function at 66kV and above.
The table below illustrates this process.

Zone Substation Type	Installed Transformer Capacity	Telephony Requirement	Two Way Radio Requirement	Backup Power
Type 1	Greater than 60MVA or AEMO interest	IP Phone	Yes	8 hours
Type 2	Less than 60MVA but greater than 20MVA	IP or 3G Phone	Yes	4 hours
Type 3	Less than 20MVA but greater than 5MVA	IP or 3G Phone	Yes	4 hours
Type 4	Less than 5MVA	3G Phone	Yes	Nil

Table 6: ZSS Categorisation Table

Reclassifying Zone Substations

In some instances a Zone Substation may have a transformer capacity that greatly exceeds the load profile of the feeders emanating from that facility. This can be due to re-purposing of spare transformers or future anticipated loads that have not yet been realised.

Where this results in a higher classification than required, and building to that classification is an unjustifiable expense, the designer should seek feedback from System Control to ascertain a realistic loading for that Zone Substation. Designers must consider the following factors:

- Expected life cycle of the telecommunications install
- Future load changes, e.g. new residential developments or industrial estates that may appear within that life cycle
- The function of the Zone Substation in the local sub-transmission network
- The cost of the lower classification install and the potential to repurpose this equipment into a higher classification if later required
- Any change of classification will need email confirmation from System Control who will also need to accept the lower SLA associated with a reduction in type classification.