Transmission Category Analysis RIN, 2017-18

Basis of Preparation

CONTACT

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Introduction

TasNetworks (Tasmanian Networks Pty Ltd, ABN 24 167 357 299) is the owner and operator of the electricity transmission network in Tasmania.

This Basis of Preparation (**BoP**) forms part of the response of TasNetworks to the Regulatory Information Notice (**RIN**) issued in March 2014 by the Australian Energy Regulator (**AER**), under Division 4 of Part 3 of the National Electricity (Tasmania) Law, for the purposes of collecting information for category analysis.

The information and explanatory material included in this BoP relate to TasNetworks' activities as Tasmania's licensed Transmission Network Service Provider (**TNSP**) during the 2017-18 Regulatory Year (referred to throughout this document as the current reporting period).

AER's Instructions

The AERs instructions in completing the category analysis RIN is to provide a BoP that demonstrates how the information provided in response to the RIN request complies with the requirement of the RIN. The minimum requirements of the BoP as per schedule 2 of the notice are set out in

Table 1 - AER Requirements of the BoP

1.2 (a)	demonstrate how the information provided is consistent with the requirements of the notice.
(b)	explain the source from which we obtained the information provided.
(c)	explain the methodology we applied to provide the required information, including any assumptions made.
(d)	explain, in circumstances where we cannot provide input for a variable using actual information and therefore must provide input using estimated information: (i) why an estimate was required, including why it was not possible to use actual information; (ii) the basis for the estimate, including the approach used, assumptions made and reasons why the estimate is our best estimate, given the information sought in the notice.

Definitions and interpretation

Aurora	Aurora Energy Pty Ltd, acting in its capacity as the licensed DNSP in Tasmania prior to 1 July 2014
CAM	Cost Allocation Method
DM	TasNetworks' Electronic Document Management System
Gentrack	TasNetworks' Electronic Document Management System
GTech	Distribution Network Service Provider
OTTER	Office of the Tasmanian Economic Regulator
POW	Programme of Work
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCS	Standard Control Services
SDW	Spatial Data Warehouse
SOM	TasNetworks' Service Order Management system
WASP	TasNetworks' program-of-work management system (Works, Assets, Solutions and People)
UG	Underground (cable)
Telecommunications	Encompasses any telecommunications related asset
Secondary Systems	Encompasses protection systems, SCADA and Network Control
Substations Primary Systems	Encompasses power transformers, switchbays, transmission cables and reactive plant
Transmission Lines	Encompasses towers, support structures and conductors
TasNetworks	Refers to Tasmanian Networks Pty Ltd, acting in its capacity as a licensed Distribution Network Service Provider in the Tasmanian jurisdiction of the National Electricity Market.
AER	Australian Energy Regulator
DNSP	Distribution Network Service Provider
RIN	Regulatory Information Notice

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Template 2.1 Expenditure summary

Table 2.1.1: Prescribed transmission services capital expenditure	**Consistency of information with the requirements of the RIN** The prescribed transmission services capital expenditure information is calculated from worksheets within the RIN with a separate balancing items spreadsheet included and is reported on an 'as-incurred' basis as per the requirements of the RIN.
	Source of information • Worksheets 2.2 – 2.10 of the RIN.
	Methodology and assumptions made • Information provided in template 2.1 has been reconciled to the amounts reported in the Regulatory financial statements and a list of balancing items has been prepared to clarify differences between the RIN and regulatory financial statements.
	Use of estimates No estimates have been required in the collation and presentation of this information.
Table 2.1.2: Prescribed transmission services operating expenditure	**Consistency of information with the requirements of the RIN** The prescribed transmission services operating expenditure information is calculated from worksheets within the RIN on an 'as-incurred' basis as per the requirements of the RIN.
	Source of information • Worksheets 2.5 - 2.10 of the RIN.
	Methodology and assumptions made Information provided in template 2.1 has been reconciled to the amounts reported in the Regulatory financial statements and a list of balancing items has been prepared to clarify differences between the RIN and regulatory financial statements.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.2 Replacement expenditure

Table 2.2.1: Expenditure and replacement volumes by asset category

Consistency of information with the requirements of the RIN

- Information presented has been split in accordance with the categories in the Templates. The corresponding asset age profile has been provided as required. As per the requirement of the RIN, the replacement volumes and expenditure are consistent with data provided in table 2.2.2 and 2.1.1. Assets of categories not owned by TasNetworks has been marked as '0' as required by the RIN instructions.

Source of information

Financial

All financial information was sourced from SAP and the Regulatory Financial Statements.

Substation switchbays and substation Power Transformers

Substation Primary Systems replacement data has been sourced from the WASP Asset Register and failure information has been sourced from the WASP defect register and confirmed against failure reports.

Conductors

Transmission Lines asset replacement data has been sourced from TasNetworks' asset register and asset failure information has been sourced from AMIS.

SCADA, network control and protection systems

- Telecommunications data has been sourced from operational drawings ,the Telecommunications Asset Register and the Telecommunications Network Management System. This information includes Telecommunication bearers, Ethernet and telephony assets.
- Secondary Systems asset replacement and failure information has been sourced from the WASP Asset Register and from SAP.

Methodology and assumptions made

Financial

- The financial data in Table 2.2.1 has been apportioned across categories using financial information for that year from SAP and the volumes of replacements.

Transmission Lines - general

- TasNetworks' owned asset replacements were sourced from the WASP asset register, filtering by assets with a commissioning date in the current reporting period. Due to changes in asset systems 2016/17 tower and conductor data has been updated based on replacement projects completed in 2017/18.
- Asset replacements resulting from augmentation projects were excluded.
- Where TasNetworks has strung a single circuit in a double circuit configuration, this has been classified as double circuit, due to the increased operational cost resulting from such an arrangement.
- Optical Ground Wire (**OPGW**) data was taken from TasNetworks' geographical information systems.
- Assets of categories not owned by TasNetworks has been marked as '0' as required by the RIN instructions.
- Transmission conductor length is represented as circuit length, this is due to it being previously recorded as such.
- Failure data is sourced from TasNetworks Transmission Outage reports. Where no failures have

been recorded a zero is recorded against the respective asset classes.

Transmission tower support structures

The support structures category includes only the following: anodes, foundations, insulators and danger signs. WASP values detail the number at each tower.

Transmission line conductor

Transmission conductor length is represented as circuit length (in metres), this is due to it being previously recorded as such.

Transmission Lines Other

- This category consists of: Dampers, tracks, support structures and weather stations. This is due to these assets not being represented elsewhere in the REPEX section of the RIN. Replaced volume is not reported in the RIN due to the different nature of the items included.

Substation switchbays

- Historical information has been sourced from the WASP asset register using Business Intelligence reporting sorted for assets that have been commissioned during the current reporting period. Only assets that were identified as replacement were included in the asset count. This was confirmed against section 2.3 and 5.2.

- We are reporting against two criteria, expected to align with what is believed other utilities adhere to. That is to group into GIS switchgear and air insulated switchgear:
- GIS switchgear is typically indoor sealed units with SF6 gas insulation encompassing the switch gear mechanism including bus bar chambers and instrument transformers (all encased).
- Air insulated switchgear in higher voltage levels (>44kV) is typically outdoor with separate disconnectors and instrument transformers although dead tank circuit breakers do have integral CT's. Voltage levels less than 44 kV are typically indoor and can have oil, vacuum, air or SF6 gas insulation medium with separate instrument transformers but within the same "air insulated" enclosure. As a result of this the following summated asset counts has been prepared.

Asset Category	Asset replacements for current reporting period
< = 33 kV ; AIR INSULATED CIRCUIT BREAKER	0
< ≈ 33 kV; VACUUM INSULATED CIRCUIT BREAKER	34
< ≈ 33 kV; OIL INSULATED CIRCUIT BREAKER	0
< ≈ 33 kV; SF6 INSULATED CIRCUIT BREAKER	0
Reported as < = 33 kV ; AIR INSULATED CIRCUIT BREAKER	34
> 33 kV & < ≈ 66 kV ; OIL INSULATED CIRCUIT BREAKER	0
> 33 kV & < ≈ 66 kV ; SF6 INSULATED CIRCUIT BREAKER	0
Reported as > 33 kV & < = 66 kV; AIR INSULATED CIRCUIT BREAKER	0

> 66 kV & < ≈ 132 kV ; OIL INSULATED CIRCUIT BREAKER	0
> 66 kV & < ≈ 132 kV ; SF6 INSULATED CIRCUIT BREAKER	1
Reported as > 66 kV & < ≈ 132 kV; AIR INSULATED CIRCUIT BREAKER	1
> 132 kV & < ≈ 275 kV ; OIL INSULATED CIRCUIT BREAKER	0
> 132 kV & < ≈ 275 kV ; SF6 INSULATED CIRCUIT BREAKER	1
Reported as > 132 kV & < ≈ 275 kV; AIR INSULATED CIRCUIT BREAKER	1

- The number of asset failures has been taken from information extracted from WASP asset 'defects' register using Business Intelligence reporting and confirmed against failure reporting and discussion with substation engineers.
- An asset failure was summarised to be an event which results in an un-planned outage of plant.
- Substation other expenditure value comprises assets not specifically captured in other 2.2.1 asset categories. It includes substation specific ancillary and minor assets including battery systems, AC distribution systems, security systems, fences, oil containment systems, etc. Substation other is not recorded in 5.2.1 as it does not constitute a major asset class.
- Due to historical asset delineation between previous separate transmission and distribution companies, assets <=44kV at a transmission substation are classed as transmission assets. Assets connected downstream from the load side connection of a transmission asset are assumed to be a distribution owned assets.

SCADA, network control and protection systems

- The number of asset failures for Telecommunications Network / Systems has been sourced from fault records extracted from the TasNetworks Telecommunications Network Management Systems. These failures are either automatically reported by self monitoring assets/site supervisory systems or manually by routine/non-routine asset inspections. Asset failure counts do not include failures caused human error/maloperations. The data extract was filted by the 2017-2018 financial year and a count of the number of failures was derived. Schemes identified as augmentation have been excluded from the total number of schemes commissioned in that financial year.
- The asset register has an attribute to capture the date a protection or SCADA scheme was commissioned. Existing schemes that were commissioned within the last financial year are counted as asset replacements. Schemes identified as augmentation have been excluded from the total number of schemes commissioned in that financial year.
- Protection and SCADA device failures are derived from defects or corrective work allocated to assets in the asset register. The number of protection or SCADA scheme failures is the sum of corrective maintenance tasks assigned to protection and SCADA equipment in the WASP works and asset register and the number of defect notifications registered to protection and SCADA equipment in SAP.
- TasNetworks reports systems and schemes at an aggregate level and therefore does not report these assets at granular level in the templates. This is applicable for the Protection schemes / systems and the Station SCADA and control systems functions only. The other functions listed in the template under this category such as 'Master Station Assets', 'Control equipment / systems', Infrastructure: protection and control', 'Metering systems', 'Site establishment', 'communications network assets' and 'Total secondary systems' are assumed to be additional

	functions that have been added to the template by other participating NSP's and are considered to have already been included in TasNetworks' Protection schemes / systems and the Station SCADA and control systems.
	Use of estimates No estimates have been used in the collation and presentation of this information.
Table 2.2.2: Selected assets characteristics	**Consistency of information with the requirements of the RIN** Information presented has been split in accordance with the categories in the templates consistent with the requirements of the RIN.
	Source of information • Substations Primary Systems • Current commissioned assets numbers have been sourced from TasNetworks' WASP asset register
	Methodology and assumptions made ***Conductors*** • Historical asset replacements were sourced from 2016/17 data has been updated based on replacement projects completed in 2017/18. • Asset replacements resulting from augmentation projects were excluded. • The following transmission lines were excluded from calculations as they are not owned by TasNetworks: o TL473 – Bluff Point-Smithton o TL474 – Studland Bay Spur o TL485 – Musselroe Bay-Derby • Assets of categories not owned by TasNetworks has been marked as '0' as required by the RIN instructions. • Parallel lines were counted separately, however the values for EB(T) 3.5.1.1 were calculated with parallel lines counted as a single circuit and as such the values in table 2.2.2 and 3.5.1.1 do not reconcile. ***Substation reactive plant*** Current asset numbers were determined by restricting the search criteria to assets commissioned in the current reporting period.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.3 Augmentation expenditure

Table 2.3.1: Augex asset data – Substations **Table 2.3: Augex asset data – Lines** **Table 2.3.4: Total Augex expenditure**	**Consistency of information with the requirements of the RIN** Information has been presented for augmentation expenditure as required under the RIN. No gifted assets have been included. Expenditure data has been included on an 'as incurred' basis. As per the requirements of the RIN, material projects have been defined as projects with nominal expenditure over the life of the project of greater than $5 million. Projects with nominal expenditure over the life of the project of less than $5 million have been defined as non-material. All project data is provided 'on a project close basis in real dollars ($2012–13) for Table 2.3.1 and Table 2.3.2, and in nominal dollars for Table 2.3.4 and excludes overheads.
	Source of information • Information regarding substation IDs, types and voltages has been sourced from TasNetworks' Asset Management Information System. • Actual incurred augmentation expenditure has been extracted from the trial balance in TasNetworks Finance system.
	Methodology and assumptions made • There are no Related Parties in the delivery of TasNetworks projects. • The substation and transformer MVA ratings provided are based on 'cyclic rating' as required by the RIN. This applies to substation normal and emergency ratings as well as individual transformer ratings. Substation ratings are typically based on nameplate ratings from the equipment manufacturer. As TasNetworks does not currently have thermal models of the transformer loading capacity, the cyclic ratings provided are a 20% increase of nameplate continuous rating.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.5 Connections expenditure

Table 2.5.1: Expenditure on connection projects	**Consistency of information with the requirements of the RIN** Information has been presented for connections expenditure in accordance with the definitions and requirements of the RIN.
	Source of information Actual incurred connections expenditure has been extracted from the trial balance in the finance system.
	Methodology and assumptions made • Total project costs and total labour costs incurred in connections expenditure were extracted from the trial balance in the finance system. Total material costs were derived by taking total labour costs from total project costs. • Contract labour has been considered to be material costs, and only internal labour costs are considered to be labour costs for the purposes of populating table 2.5.1.
	Use of estimates No estimates have been used in the collation and presentation of this information.
Table 2.5.2: Description of connection projects	**Consistency of information with the requirements of the RIN** Information has been presented for connections expenditure in accordance with the definitions and requirements of the RIN.
	Source of information • The descriptions of connection projects undertaken have been sourced from the Certificates of Operational Completion for each project. • Connection point rating information has been sourced from the asset management information system (**AMIS**).
	Methodology and assumptions made • Descriptions of connection projects align with the Regulatory Assets Register and the asset management information system. • The connection MVA ratings provided are based on 'cyclic rating' as required by the RIN. Substation ratings are typically based on nameplate rating from the equipment manufacturer. As TasNetworks does not currently have thermal models of the transformer loading capacity, connection ratings (MVA) provided are a 20% increase of nameplate continuous rating.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.6 Non-network expenditure

Table 2.6.1: Non-network expenditure	**Consistency of information with the requirements of the RIN** The information provided for non-network expenditure is consistent with the requirements of the RIN in that we have reported on all asset classes required in table 2.6.1 as well as any asset classes for which we have incurred more than $1 million or more in nominal capital expenditure over the last five regulatory years.
	Source of information The information in Table 2.6.1 Non-Network Expenditure was sourced from TasNetworks' financial accounting systems SAP and TasNetworks' Fleet Management System.
	Methodology and assumptions made ***IT and Communications*** • Client device expenditure is expenditure that relates to a hardware device that accesses services made available by a server. Items included in this category are the costs associated with our IT service provider, plus all capital expenditure associated with the purchase of desktop computers, laptops, tablets etc. • Recurrent expenditure relates to expenditure that occur on a regular on-going basis and would include the operating labour costs of the IT department, plus all costs associated with landlines, mobile phones, software, data communications etc. • Expenditure included in the non-recurrent expenditure category are items that occur on a non-recurring basis. ***Motor vehicles*** • All motor vehicles are split into the relevant RIN category per the category number generated from the Fleet Management System. Costs are then allocated on a proportionate basis per the number of vehicles within each category for determining Opex expenditure. Capex expenditure is the value of additions within the financial year, split into the relevant motor vehicle category.
	Use of estimates No estimates have been used in the collation and presentation of this information.
Table 2.6.2: Annual descriptor metrics – IT and communications expenditure	**Consistency of information with the requirements of the RIN** The information provided for non-network expenditure is consistent with the requirements of the RIN.
	Source of information The descriptor metrics relating to TasNetworks IT & Communications expenditure has been sourced from TasNetworks' Human Resources system (Peoplesoft) at the end of the financial year. The numbers provided are as per the TasNetworks' published accounts.
	Methodology and assumptions made Employee numbers represent total TasNetworks employee numbers as published in the annual accounts.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Table 2.6.3: Annual descriptor metrics – Motor vehicles	**Consistency of information with the requirements of the RIN** The information provided for non-network expenditure is consistent with the requirements of the RIN.
	Source of information Information regarding TasNetworks' vehicle fleet has been sourced from TasNetworks' Fleet Management Systems (AusFleet) and TasNetworks' Financial System (Navision).

	Methodology and assumptions made
	Kilometres travelled
	The opening and closing odometer readings for each vehicle were used to calculate the kilometres travelled in the current reporting period, with the kilometres travelled then sorted by category of vehicle and aggregated.
	
	Proportion of fleet expenditure
	• The proportion of fleet expenditure was derived by:
	  ○ gathering motor vehicle expenditure for each vehicle;
	  ○ allocating each motor vehicle to the appropriate asset category as per the RIN template;
	  ○ calculating the total expenditure for each category of motor vehicle;
	  ○ splitting out the cost of each category of vehicle into prescribed and non-prescribed expenditure; and
	  ○ calculating the Regulatory Percentage by dividing prescribed expenditure by total expenditure.

	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.7 Vegetation management

Table 2.7.1: Descriptor metrics by zone

Consistency of information with the requirements of the RIN

The information provided for vegetation management is consistent with the requirements of the RIN.

As part of its licence requirements, TasNetworks produces and maintains an Easement Management Plan and Transmission System Management Plan (**TSMP**). TasNetworks is not subject to any other external regulatory requirements for vegetation management.

TasNetworks internally mitigates its bushfire risk through the implementation of recommendations made within the Easement Management Plan and TSMP. It also undertakes periodic external audits of its vegetation management and bushfire mitigation practices to minimise risk, liability and insurance costs.

All vegetation management costs submitted within this RIN can be considered to be the cost associated with TasNetworks' compliance with the TSMP and other, self-imposed standards.

A high percentage of TasNetworks transmission lines are located in forested and other rural areas that are populated with rapidly growing species of vegetation.

Source of information

Route line length within zone

The total route line length, is the sum of all the spans and has been sourced from WASP asset data. It includes all TasNetworks-owned transmission lines, even if not currently in service.

Number of maintenance spans

Information has been sourced from completed work orders (from our asset management system) which have been issued to vegetation management contractors.

Total length of maintenance spans

Information has been sourced from the asset management information system.

Average number of trees per maintenance span

- Information regarding the total number of vegetation maintenance spans has been sourced from completed work orders which have been issued to vegetation management contractors; and
- Information for the quantification of vegetation density categories was sourced internally through experience of TasNetworks' easements and the types of vegetation typically encountered.

Length of vegetation corridors

Information has been sourced from the geographical information system.

Average width of vegetation corridors

Information has been sourced from the geographical information system.

Average frequency of cutting cycle

Information has been sourced from the Transmission Line Easement Asset Management Plan.

Methodology and assumptions made

The assumption has been made that the entire network is in one zone only.

Route line length within zone

The total route line length is the sum of all the spans and has been sourced from WASP asset data. It includes all TasNetworks-owned transmission lines, even if not currently in service.

Number of maintenance spans

- Information has been extracted from the asset management system for completed work orders.
- Where a span has been maintained more than once in the current reporting period, only one maintenance span has been counted.

Total length of maintenance spans

- Information has been sourced from the asset management information system.
- The length of the forward looking span has been used in the calculation of total length of the maintenance span.

Average number of trees per maintenance span

- The density of vegetation within the spans has been determined:
    - using vegetation density data collected by contractors approximately 10 years ago; and/or;
    - By viewing the spans via an online medium (e.g. Google Earth) and, through experience, assigning a particular density to the vegetation in like areas;
    - using data provided by Forestry Tasmania in quantifying 'Medium' vegetation density;
    - By quantifying other vegetation density categories internally through experience of TasNetworks' easements and the types of vegetation typically encountered;
- TasNetworks has interpreted the definition as requiring TasNetworks to report the total number of trees that could require maintenance within a span in which one or more vegetation defects have been identified;
- The average number of trees per vegetation maintenance span has been arrived at by multiplying the span length (for the span where the maintenance was completed) by the easement width by the determined density of vegetation within each of the spans (as discussed in the estimates used section below);
- Historically, TasNetworks' field works management processes, asset information systems and reporting tools have not collected information regarding geography and the height of trees, and hence TasNetworks has not considered these in the calculation of its average number of trees per maintenance span; and
- Where TasNetworks does not have access to vegetation density data, it has excluded those vegetation maintenance spans from its calculations.

Length of vegetation corridors

Information has been sourced from the geographical information system. Where more than one transmission line runs parallel, only one length has been counted as a vegetation corridor.

Average width of vegetation corridors

- The total area of all corridors has been sourced from the geographical information system, applying a 50m or 60m easement width depending on voltage, with these then being

	merged to create a single area. This area (of all corridors) was then divided by the total length of the vegetation corridors as sourced from the geographical information system. • It has been assumed that 110 kV transmission lines have an easement width of 50m, and 220 kVA lines have a width of 60m and that this width is consistent across our network.
	Use of estimates Unless specified below, no estimates have been used in the collation and presentation of this information. ***Average number of trees per maintenance span*** The determined density factor has been broken down into four bands, and an estimate has been required to determine the number of trees in each band of density (through practical experience and through an assessment of aerial photos for each easement where vegetation maintenance has occurred). This estimate has been required as information has historically been impracticable to collect and maintain. • Pasture = 5 trees per Ha • Low = 50 trees per Ha • Medium = 1300 per Ha (approximately equal to typical Forestry Tasmania plantation density) • High = 2000 per Ha ***Average width of vegetation corridors*** TasNetworks has applied standard easement widths in the calculation of this value (as physically maintained by TasNetworks in the field), rather than utilising actual easement widths. In the majority of cases these will be the same. TasNetworks considers the effort required to determine these actual widths to be excessive for the benefit achieved in terms of accuracy and for comparative purposes.
Table 2.7.2: Expenditure metrics by zone	**Consistency of information with the requirements of the RIN** The information provided for vegetation management is consistent with the requirements of the RIN. As part of its licence requirements, TasNetworks produces and maintains an Easement Management Plan and Transmission System Management Plan (TSMP). TasNetworks is not subject to any other external regulatory requirements for vegetation management. TasNetworks internally mitigates its bushfire risk through the implementation of recommendations made within the Easement Management Plan and TSMP. It also undertakes periodic external audits of its vegetation management and bushfire mitigation practices to minimise risk, liability and insurance costs. All vegetation management costs submitted within this RIN can be considered to be the cost associated with TasNetworks' compliance with the TSMP and other, self-imposed standards. A high percentage of TasNetworks transmission lines are located in forested and other rural areas that are populated with rapidly growing species of vegetation.
	Source of information The reported vegetation management information has been sourced from the general ledger in the Sun finance system.
	Methodology and assumptions made • Information was sourced from the general ledger in the finance system by extracting costs by contractor to ascertain the amount spent for contracted services for the current

	reporting period. Work orders were obtained to confirm the nature of the contracted service provided. • No contractor liaison costs were able to be sourced from contractor work orders. As such, any contractor liaison costs that were incurred are included within Other vegetation management costs.
	Use of estimates No estimates have been used in the collation and presentation of this information.
Table 2.7.3: Descriptor metrics for unplanned vegetation events	**Consistency of information with the requirements of the RIN** Information reported has been provided in accordance with the definitions provided in the RIN.
	Source of information Information from SAP is based on actual outages recorded for the current reporting period
	Methodology and assumptions made • Review of outage reports was undertaken to determine the cause of outage. • Wind borne debris, (eg. Bark) was not considered as an outage caused by vegetation.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.8 Maintenance

Table 2.8.1: Descriptor metrics for routine and non-routine maintenance

Consistency of information with the requirements of the RIN

The information provided for maintenance is consistent with the requirements of the RIN.

Information was not able to be sourced for the asset track maintenance and decommissioned assets. The highest value asset type in each asset group is used as the basis for the average age.

Source of information

Telecommunications network / Systems

Information has been sourced from the internally maintained telecommunications asset register, the Telecommunications RIN Data MS Excel spreadsheet, and from the asset management plan.

Access track maintenance and decommission assets

Information was not able to be sourced for these assets. Many of these assets are not owned by TasNetworks and the collation of such information would be impracticable.

Substation equipment and property maintenance

- Information has been sourced from the asset management information system and the asset management plan; and
- Asset 'inspection/maintained' data was obtained from the asset management information system and BASIX.

Substation Secondary assets

Asset quantities and average age is derived from SAP and the number of protection schemes maintained is derived from a log of maintenance test reports stored in TasNetworks' document management system The ZoNe. Asset maintenance cycles are derived from TasNetworks' Transmission Protection and Control Asset Management Plan.

All other assets

Information has been sourced from the asset management information system and the asset management plan.

Methodology and assumptions made

General

Asset quantities in this table have been collected for those assets that have undergone either routine or non-routine maintenance.

Transmission Towers

- The number of towers and the line lengths owned, inspected and maintained were extracted from the asset management information system; and
- The number of transmission towers maintained includes commissioned, decommissioned and out of service towers whereas quantities reported in table 5.2 only includes commissioned towers.

Transmission Tower Support Structures

No value has been entered against transmission tower support structures as all towers and associated fittings (ie: insulators, foundations, dampers, anodes etc.) have been deemed to be

accounted for in the transmission towers quantity. This is different to data reported in table 5.2 where the individual replacement assets (ie: insulators, foundations, signs etc.) are included in the transmission tower support structures numbers.

Substation equipment and property maintenance

- Switch bays, cables and transformers are visually inspected several times per year as part of substation inspections and hence TasNetworks has specified that all assets are inspected on a similar inspection cycle;
- In calculating the number of switch bays maintained, TasNetworks has assumed that a switchbay comprises a $Circuit\ Breaker + Disconnector + CT + VT$. As such, the switchbay count is taken to be the number of circuit breakers only. This point needs to be considered when comparing to asset age profile data provided in table 5.2;
- In calculating the number of transformers maintained, TasNetworks has included those transformers where tap changer maintenance has been completed, and excluded those transformers where only condition monitoring was undertaken (eg. bushing and/or oil testing); and
- Average age has been calculated as follows:
    - $Transmission\ cables\ average\ age = \frac{age\ x\ length}{total\ length}$
    - $substation\ property = (\Sigma\ of\ current\ date - commissioning\ date)/\ number\ of\ properties$
    - $Power\ transformers = (\Sigma\ of\ current\ date - commissioning\ date)/\ number\ of\ transformers$
    - $Switchbays = (\Sigma\ of\ current\ date - commissioning\ date)/\ number\ of\ switchbays$

SCADA and network control maintenance

- The SCADA systems quantity includes the number of SCADA schemes registered in SAP with a commissioned date prior to the end of the period. SCADA schemes are defined as one or more SCADA Gateways on a per site basis, and excludes Bay Controllers and
- The average SCADA scheme asset age is derived from the average of the SCADA scheme commissioned dates. The number of SCADA schemes inspected/maintained is equal to the number of protection schemes inspected/maintained because the SCADA scheme forms part of the protection scheme tests during the inspection/maintenance.

Protection systems maintenance

- Protection system asset count includes Bus Coupler, Bus Zone, Capacitor Bank, HV Feeder, System Protection, Station Services Transformer, Transformer and Transmission Circuit schemes with a commissioned date prior to the end of the period;
- The average protection scheme asset age is derived from the average of the protection scheme commissioned dates; and
- Maintenance cycle is as per the relevant asset management plans.

Other maintenance

The telecommunications routine/preventative asset maintenance cycles have been estimated to be done on 0.5 yearly, 1 yearly and 2 yearly cycles as per the TasNetworks Telecommications Asset Management Plans.

This is not the count of actual maintenances performed from the TasNetworks' SAP based Asset

	Management System. As TasNetworks has migrated to a SAP based asset management system in 2017 to 2018 financial year will be some data migration issues from legacy systems to SAP. The SAP based actual asset recording system was not fully operational in the 2017-2018 financial year as the Asset Management component was commissioned in March 2018 . The entries in the 2.8 Maintenance tab for "INSPECTION CYCLE (YEARS)" and "MAINTENANCE CYCLE (YEARS)" are the inspection and maintenance cycle for the minimum period 0.5 yearly as per the TasNetworks Telecommunications Asset Management Plans.
	Use of estimates Unless otherwise specified, No estimates have been used in the collation and presentation of this information. ***Other maintenance*** ***Telecommunications Assets*** The telecommunications routine/preventative asset maintenance cycles have been estimated to have be done on 0.5 yearly, 1 yearly and 2 yearly cycles as per the TasNetworks Telecommications Asset Management Plans. This is not the count of actual maintenances performed from the TasNetworks' SAP based Asset Management System.
Table 2.8.2: Cost metrics for routine and non-routine maintenance	**Consistency of information with the requirements of the RIN** The information provided for maintenance is consistent with the requirements of the RIN in that the highest value asset type in each asset group is used as the basis for the average age.
	Source of information Information has been sourced from the finance system, asset management information system and the asset management plan.
	Methodology and assumptions made • Information was sourced from SAP. ▪
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.10 Overheads

Table 2.10.1: Network overheads expenditure **Table 2.10.2: Corporate overheads expenditure**	**Consistency of information with the requirements of the RIN** The information provided for overheads is consistent with the requirements of the RIN in that it includes all expenditure that cannot be directly attributed to a work activity, project or work order. **Source of information** Historical information has been extracted from the audited Regulatory financial statements for both network and corporate overhead expenditure. **Methodology and assumptions made** • For both network and corporate overhead expenditure: o Prescribed overhead expenditure has been extracted from the audited Regulatory financial statements; o Non-prescribed overhead expenditure has been extracted from the finance system, which is broken down into the required expenditure subcategories; • TasNetworks capitalises overheads to ensure that all costs directly attributable to bringing an asset to the location and condition necessary for its use are capitalised; and • The overhead costs included in this worksheet include both capital and operational overheads which are separated in table 2.1. ***Negotiated Services & Unregulated Services Overhead Expenditure*** Each category reflects the gross cost incurred in that category, prior to the application of overheads recovered. **Use of estimates** No estimates have been used in the collation and presentation of this information.

Template 2.11 Labour

Table 2.11.1: Cost metrics per annum **Table 2.11.2: Descriptor metrics**	**Consistency of information with the requirements of the RIN** The information provided for labour is consistent with the requirements of the RIN in that only labour costs allocated to the provision of prescribed transmission services have been reported in the labour costs tables.
	Source of information TasNetworks finance system and directly from TasNetworks payroll system.
	Methodology and assumptions made • Information regarding the full time equivalent average staffing level has been determined with reference to the staff list at year end, which details staff headcount by department and by labour classification level. • The total labour costs per average staffing level have been determined using the cost allocated to prescribe services based on TasNetworks CAM and the payroll report per classification levels. • The average productive work hours per average staffing level have been determined based on a standard working week for all employees, with allowances made for leave. • The average productive work hours hourly rate per average staffing level is the labour cost divided by the average productive work hours per average staffing level. • Overtime includes only salary and wage costs as per the definition in the RIN and not any related oncosts.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 2.12 Input tables

Table 2.12: Input tables	**Consistency of information with the requirements of the RIN** The information provided is consistent with the requirements of the RIN.
	Source of information Information presented on the Input tables worksheet has been sourced from other worksheets in the RIN templates.
	Methodology and assumptions made The split of costs into the categories required by the RIN was based on actual expenditure in the year from the finance system, with a percent of costs to each actual category (i.e. direct materials) then applied across the line items in the RIN.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 5.2 Asset age profile

Table 5.2.1: Asset age profile

Consistency of information with the requirements of the RIN

The information provided for asset age profile is consistent with the requirements of the RIN in that the expenditure and asset replacement / asset failure volumes for each sub-category reconcile to the higher level asset category.

Source of information

- The economic lives of assets and the age of assets currently in commission have been sourced from information maintained within SAP.
- The economic lives and age of telecommunications assets currently in commission were sourced from the telecommunications asset register, telecommunications operational drawings and asset management plans.
- For the Station SCADA and control systems, an additional system has been added to 2013-14 and an additional system to 2015-16 due to late entry of these SCADA systems to the equipment register.

Methodology and assumptions made

General

- Information was extracted from the asset management information system. Information was filtered on commissioned status to exclude assets not currently in commisision and year of commissioning. Where a parent asset has multiple child assets, the age of the parent asset has been presented.
- The mean age presented is the useful life of the assets for each category.
- The standard deviation has been calculated as the square root of the mean for each asset category, in accordance with the definitions included within the RIN.

Transmission towers

The volumes were extracted from 2016/17 WASP data and updated due to the know volumes based on the projects completed in 2017/18. This figure differs from section 2.8.1 where the number of towers maintained includes commissioned, decommissioned and out of service towers.

Ecomonic ages and standard deviation data is sourced from the relevant Asset management Plan (AMP).

Transmission tower support structures

The values entered for the support structures category includes the following: anodes, foundations, insulators and danger signs that have been replaced on existing Transmission Towers. This is different to table 2.8 where all these components have been counted as part of the Transmission Towers.

Transmission line conductor and OPGW

Transmission conductor length is represented as circuit length in m whereas OPGW is represented in km, this is due to it being previously recorded as such.

Substation switchbays

- Substation switchbay asset grouping has been categorised according to either GIS module or air insulated categories where:
  - GIS switchgear is typically indoor sealed units with SF6 gas insulation encompassing the switch gear mechanism including bus bar chambers and instrument transformers (all encased); and
  - Air insulated switchgear in higher voltage levels (>44kV) is typically outdoor with

separate disconnectors and instrument transformers although dead tank circuit breakers do have integral CT's. Voltage levels less than 44 kV are typically indoor and can have oil, vacuum, air or SF6 gas insulation medium with separate instrument transformers but within the same "air insulated" enclosure. When cross referencing to data recorded in 2.8 it is noted that for an individual switchbay it is taken to be the number of circuit breakers only as a switchbay can comprises a circuit breaker + disconnector+ CT+ VT as applicable.

- Due to historical asset delineation between previous separate transmission and distribution companies, assets <=44kV at a transmission substation are classed as transmission assets. Assets connected downstream from the load side connection of a transmission asset are construed to be a distribution owned assets.

SCADA, network control and protection systems

- The Data from the telecommunications information sources has been collated into a spreadsheet to enable calculation of asset age profile. The source data was based on the information collated for the development of the asset management plans with the data brought into a single asset list in the template;
- The telecommunications asset suite includes assets with 45 year, 10 year and 5 year economic lifes. The mean economic life is the weighted average of all telecommunications assets;
- The commissioned date attribute of the associated protection and SCADA schemes has been used to determine the quantities of schemes installed per year; and
- TasNetworks report systems and schemes at an aggregate level and therefore do not report these assets at granular level in the templates. This is applicable for the Protection schemes / systems and the Station SCADA and control systems functions only. The other functions listed in the template under this category such as 'Master Station Assets', 'Control equipment / systems', Infrastructure: protection and control', 'Metering systems', 'Site establishment', communications network assets and 'Total secondary systems' are assumed to be additional functions that have been added to the template by other participating NSP's and are considered to have already been included in TasNetworks' Protection schemes / systems and the Station SCADA and control systems.

Other

- The assets categories included as 'other' are:
  - 66 kV & < = 132 kV; Coupling Capacitors;
  - 132 kV & < = 275 kV; Coupling Capacitors;
  - 66 kV & < = 132 kV; Wave Traps; and
  - 132 kV & < = 275 kV; Wave Traps.
- When cross referencing to "Substation other" data recorded in 2.2.1 it is noted that Substation other assets covers specific ancillary and minor assets including battery systems, AC distribution systems, security systems, fences, oil containment systems, etc. These minor assets are not included in 5.2.1 and as such no direct comparison to 2.2.1 can be made. Zero's have been provided where appropriate to reflect that they have been considered but no meaningful data is recorded.

Use of estimates

Unless specified below, no estimates have been used in the collation and presentation of this information.

Transmission tower support structures

	Incomplete data regarding installation dates of transmission tower support structures has been estimated by using the next most appropriate parent dates linked to that asset.

Template 5.3 Maximum demand at network level

Table 5.3.1: Raw and weather corrected coincident MD at network level	**Consistency of information with the requirements of the RIN** Information has been provided regarding maximum demand at the network level in accordance with the definitions included within the RIN. The maximum demand transported through the network has been taken from the downstream settlement location in Tasmania, and includes Basslink transfers at the time of Tasmanian maximum demand.
	Source of information ***Raw network coincident maximum demand*** Information has been sourced from TasNetworks' metering and billing system. ***Date and time period maximum demand occurred*** Information has been sourced from TasNetworks' metering and billing system. ***Winter/summer peaking*** Information has been sourced from TasNetworks' metering and billing system. ***Embedded generation*** Embedded generation data downstream of connection point Have been sourced from TasNetworks distribution metering data. ***Weather corrected maximum demand – 10% or 50% probability of exceedance*** Historical information has been sourced from TasNetworks' metering and billing system. Weather data has been sourced from the Bureau of Meteorology. Where possible, the closest weather station data have been used to determine the weather correction for each connection point. For each connection point there is a corresponding weather station, with satisfactory historical data collection.
	Methodology and assumptions made • Raw network coincident maximum demand assumptions: o Information extracted includes the maximum demand on the Tasmanian network, and the load being transmitted by Basslink at the time of maximum demand on the Tasmanian network o Information relating to Basslink is included in the raw network coincident maximum demand where Basslink is exporting electricity • Coincident weather adjusted maximum demand is derived based on the following methodology: o The closest weather station data have been used where possible, to determine the weather correction for each connection point. For each connection point there is a corresponding weather station, with satisfactory historical data collection. o Based on historic daily maximum and minimum temperatures obtained from Bureau of Meteorology, Daily effective temperatures have been calculated in accordance with the definition provided by NIEIR, which is defined as the weighted average of the overnight minimum and the previous daily maximum. The daily minimum was assigned a weight of 0.8, while the previous day's maximum a weight of 0.2 in this calculation.

	○ Annual minimum effective temperatures for the period from 1970 to current regulatory year were extracted from the calculated daily effective temperatures. ○ The temperatures at 10% and 50% probability of exceedance were derived from the annual minimum effective temperatures for the period from 1970 to current regulatory year. ○ Daily maximum demand has been taken from metering data and effective temperature data has been taken from previous calculations for weekdays for current regulatory year. ○ The assumption has been made that demand of the major industrial companies and Basslink flow are not dependent on weather, and this load has not been forecast to change with the 10% or 50% probability of exceedance. ○ Weather adjustments for winter and summer (seasons) have been done separately. ○ December to March are considered summer months. June to September are considered winter months. ○ The difference between the probability of exceedance temperature and the lowest of the daily effective temperature or the historic maximum of annual lowest effective temperatures has been multiplied by the load sensitivity to determine the total change in demand for the probability of exceedance.
	Use of estimates No estimates have been used in the collation and presentation of this information.

Template 5.4 Maximum demand and utilisation at spatial level

Table 5.4.1: Non-coincident and coincident maximum demand	**Consistency of information with the requirements of the RIN** The information provided for maximum demand at network level is consistent with the requirements of the RIN.
	Source of information ***Connection Point Rating*** Information has been sourced from the asset management information system. ***Raw adjusted maximum demand*** • Information has been sourced from the metering and billing system. • There are no identified temporary load transfers in the network. ***Date and time period maximum demand occurred*** Information has been sourced from TasNetworks' metering and billing system. ***Winter/summer peaking*** Information has been sourced from TasNetworks' metering and billing system. ***Embedded generation*** TasNetworks does not have information on historical embedded generation data downstream of connection points. ***Weather corrected maximum demand – 10% or 50% probability of exceedance*** • Historical information has been sourced from the metering and billing system. • Weather data has been sourced from the Bureau of Meteorology.
	Methodology and assumptions made • Where ratings change with season (transmission lines for instance) the rating that applies at the relevant season is used. • The substation MVA ratings provided are based on 'cyclic rating' as required by the RIN. Substation ratings are typically based on nameplate rating from the equipment manufacturer. As TasNetworks does not currently have thermal models of the transformer loading capacity the cyclic ratings provided are a 20% increase of nameplate continuous rating. It is noted that all connection points have been provided with cyclic loadings details including those not owned by TasNetworks (ie. Comalco and Temco). • For operation of transmission lines, TasNetworks uses dynamic line ratings based on real time wind speed, temperature and conductor tension monitors. However, for planning studies, TasNetworks uses static (winter and summer) ratings based on 'normal operating conditions'. Normal operating conditions for transmission line planning are 25°C and 0.5 m/sec wind speed for summer and 15°C and 0.5 m/sec wind speed for winter. Where applicable the templates are populated with static ratings of transmission lines. • Weather corrected maximum demand is derived based on the following methodology and assumptions: ○ The closest weather station data have been used where possible, to determine the weather correction for each connection point. For each connection point there is a

corresponding weather station, with satisfactory historical data collection.

- Based on historic daily maximum and minimum temperatures obtained from Bureau of Meteorology, Daily effective temperatures have been calculated in accordance with the definition provided by NIEIR, which is defined as the weighted average of the overnight minimum and the previous daily maximum. The daily minimum was assigned a weight of 0.8, while the previous day's maximum a weight of 0.2 in this calculation.
- Annual minimum effective temperatures for the period from 1970 to current regulatory year were extracted from the calculated daily effective temperatures.
- The temperatures at 10% and 50% probability of exceedance were derived from the annual minimum effective temperatures for the period from 1970 to current regulatory year.
- Daily maximum demand has been taken from metering data and effective temperature data has been taken from previous calculations for weekdays for current regulatory year.
- The assumption has been made that demand of the major industrial companies and Basslink flow are not dependent on weather, and this load has not been forecast to change with the 10% or 50% probability of exceedance.
- Weather adjustments for winter and summer (seasons) have been done separately.
- December to March are considered summer months. June to September are considered winter months.
- The difference between the probability of exceedance temperature and the lowest of the daily effective temperature or the historic maximum of annual lowest effective temperatures has been multiplied by the load sensitivity to determine the total change in demand for the probability of exceedance.

Use of estimates

No estimates have been used in the collation and presentation of this information.


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