Economic Benchmarking Regulatory Information Notice

Basis of Preparation

Audited Data

30 April 2014

This page has been left intentionally blank.

Glossary of terms

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AFW	Application for Work
BOM	Bureau of Meteorology
EBSS	Efficiency Benefit Sharing Scheme
GWh	Gigawatt hours
IRSR	Intra and Inter Regional Settlements Residues
kV	kilovolt
MDP	Meter Data Provider
MIC	Market Impact Component
MLF	Marginal Loss Factor
MMS	Market Management System
MVA	Mega volt ampere
MVAr	Megavar
MW	Megawatt
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company Limited
NOS	Network Outage Scheduler
PTRM	Post Tax Revenue Model
RIN	Economic Benchmarking RIN issued by the AER, 28 November 2013
Rules	National Electricity Rules
SCADA	Supervisory Control and Data Acquisition
STPIS	Service Target Performance Incentive Scheme
TAPR	Transmission Annual Planning Report
TNI	Transmission Node Identifier

This page has been left intentionally blank.

Sheet: 2. Revenue

Table: 2.1 Revenue Grouping by chargeable quantity

Variable: ***TREV0101 – From Fixed Customer (Exit Point) Charges***
TREV0102 – From Variable Customer (Exit Point) Charges
TREV0103 – From Fixed Generator (Entry Point) Charges
TREV0104 – From Variable Generator (Entry Point) Charges
TREV0105 – From Fixed Energy Usage Charges (Charge per day basis)
TREV0106 – From Variable Energy Usage charges (Charge per kWh basis)
TREV0107 – From Energy based Common Service and General Charges
TREV0108 – From Fixed Demand based Usage Charges
TREV0109 – From Variable Demand based Usage Charges
TREV0110 – Revenue from other Sources

RIN Requirements

This section has been completed in accordance with chapter 2, section 2.1 of the Benchmarking RIN Instructions and Definitions.

Consistent with the RIN requirements[1], unless stated otherwise all amounts reported reconcile to the Prescribed Transmission Services revenues reported in the Income Statement forming part of Powerlink's Regulatory Financial Statements. In instances where a difference exists an explanation and reconciliation has been provided.

Table 2.1 has been populated with actual data.

Source

All financial information required to complete this table was sourced from Powerlink's Grid Revenue Billing System.

Methodology and Assumptions

Powerlink has prepared its response using actual information contained in its Grid Revenue Billing System. The system is used to manage billing for all of Powerlink's customers, which include DNSPs and directly connected customers.

Variables	Assumptions / Data Source
TREV0101	***Fixed connection charges –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0102	***Variable connection charges –*** Powerlink does not have any customers with variable connection charges. As permitted under the RIN[2], Powerlink has therefore included a value of zero in these cells.
TREV0103	***Fixed generators connection charges –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0104	***Variable generators connection charges –*** Powerlink does not have any customers with variable generator charges. As permitted under the RIN[3], Powerlink has therefore

[1] Australian Energy Regulator (2013a). Economic Benchmarking RIN for Transmission Network Service Providers, Instructions and Definitions, Queensland Electricity Transmission Corporation Limited, p.12.
[2] Australian Energy Regulator (2013a). pp.6, 12.

	included a value of zero in these cells.
TREV0105	***Fixed nominated demand charges –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0106	***Variable metered charges –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0107	***General and Common charges –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0108	***Fixed charges from Customers under Maximum Contract Demand agreements –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0109	***Variable charges from Customers under Maximum Contract Demand agreements –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0110	***Revenue from other sources –*** sourced from the following: - Intra and Inter Regional Settlements Residues (IRSR); - Over/under collections; - Grid Support; and - Other Revenue.

[3] Australian Energy Regulator (2013a). pp.6, 12.

Table: 2.2 Revenue Grouping by type of connection

Variable: TREV0201 – From Other connected transmission networks
TREV0202 – From Distribution networks
TREV0203 – From Directly connected end–users
TREV0204 – From Generators
TREV0205 – Other revenue

RIN Requirements

This section has been completed in accordance with chapter 2, section 2.1 of the Benchmarking RIN Instructions and Definitions.

Consistent with the RIN requirements[4], unless stated otherwise all amounts reported reconcile to the Prescribed Transmission Services revenues reported in the Income Statement forming part of Powerlink's Regulatory Financial Statements. In instances where a difference exists an explanation and reconciliation has been provided.

Table 2.2 has been populated with actual data.

Source

All financial information required to complete this table was sourced from Powerlink's Grid Revenue Billing System.

Methodology and Assumptions

Powerlink has prepared its response using actual information contained in its Grid Revenue Billing System.

Variables	Assumptions / Data Source
TREV0201	***Other connected transmission networks –*** Under the current TUOS pricing arrangements, Powerlink does not earn revenue from Other Connected Transmission Networks. As permitted under the RIN[5], Powerlink has therefore included a value of zero in these cells.
TREV0202	***Distribution networks –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0203	***Total revenue from directly connected end users –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0204	***Generators –*** sourced from Powerlink's Grid Revenue Billing System.
TREV0205	***Other Revenue –*** sourced from the following: - Intra and Inter Regional Settlements Residues (IRSR); - Over/under collections; - Grid Support; - Other Revenue.

[4] Australian Energy Regulator (2013a). p.6.
[5] Australian Energy Regulator (2013a). pp.6, 12.

Table: 2.3 Revenue (penalties) allowed (deducted) through incentive schemes

Variable: ***TREV0301 – EBSS***
TREV0302 – STPIS
TREV0303 – Other

RIN Requirements

This section has been completed in accordance with chapter 2, section 2.1 of the Benchmarking RIN Instructions and Definitions.

Table 2.3 has been populated with actual data.

Source

The EBSS data was obtained from the AER's Final Decision on Powerlink's Transmission Determination 2012/13 to 2016/17 (April 2012).

The STPIS data was obtained from the AER's notification of the approval of Powerlink's performance against the service target performance incentive scheme for each calendar year.

Methodology and assumptions

Variables	Assumptions/Source
TREV0301	***EBSS*** – obtained from the AER Final Decision for Powerlink (April 2012). As Powerlink was not subject to the AER's EBSS prior to 2007/08, values of zero have been entered into the templates for those years consistent with RIN requirements.
TREV0302	***STPIS*** – sourced from the AER's annual notification of Powerlink's approved performance against STPIS. As required under the RIN, figures reflect the year in which the incentive applied to Powerlink's revenues[6]. As Powerlink was not subject to the financial service performance scheme prior to 2007/08, a value of zero has been entered into the template for 2006 to 2008 consistent with RIN requirements.
TREV0303	***Other*** – no other revenue (penalties) allowed (deducted) through incentive schemes to be reported. As permitted under the RIN[7], Powerlink has therefore included a value of zero in these cells consistent with RIN requirements.

[6] Australian Energy Regulator (2013a). p.13.
[7] Australian Energy Regulator (2013a). pp.6, 12.

Sheet: 3. Opex

Table: 3.1 Opex Categories

Sub-table: 3.1.1 Current opex categories and cost allocations

RIN requirements

Powerlink has not changed its Cost Allocation Methodology[8], the basis of preparation for its Regulatory Financial Statements or response to the Information Guidelines in the past eight years. This statement should be read in the context of and is applicable to all opex tables under the RIN.

Consistent with the RIN requirements[9], this table is not required to be completed and has been blacked out.

[8] Powerlink Cost Allocation Methodology, V2, AER approved, 15 August 2008.
[9] Australian Energy Regulator (2013a). p.14.

Table: 3.1 Opex Categories

Sub-table: 3.1.2 Historical opex categories and cost allocations

RIN requirements

This section has been completed in accordance with chapter 3, section 3.1 of the Benchmarking RIN Instructions and Definitions.

Consistent with the RIN requirements[10], unless stated otherwise all amounts reported reconcile to the Prescribed Transmission Services expenditure reported in the Income Statement and/or supporting schedules forming part of Powerlink's Regulatory Financial Statements. In instances where a difference exists an explanation has been provided.

Table 3.1.2 has been populated with actual data.

Source

All financial information for the period 2008 to 2013 was sourced from the Historic Opex by Expenditure Category schedule that forms part of the Regulatory Financial Statements submitted to the AER annually.

All financial information for the period 2006 and 2007 was sourced from the Disaggregated Statement of Financial Performance (Prescribed Services) forming part of the Regulatory Financial Statements submitted to the AER for these years.

Methodology and Assumptions

Financial Information for the period 2008 – 2013
The Historic Opex by Expenditure Category schedule in the Regulatory Financial Statements contains a greater level of detail on the Opex activities than that reported in the Income Statement and as such has been used to populate this table.

Financial Information for the period 2006 – 2007
Financial information reflects the information contained in the Regulatory Financial Statements for 2006 and 2007 financial years.

[10] Australian Energy Regulator (2013a). p.15.

Table: 3.2 Provisions

Variable: ***TOPEX0201 – The carrying amount at the beginning of the period***
TOPEX0202 – Increases to the provision
TOPEX0203 – Amounts used (that is, incurred and charged against the provision) during the period
TOPEX0204 – Unused amounts reversed during the period
TOPEX0205 – The increase during the period in the discounted amount arising from the passage of time and the effect of any change in the discount rate
TOPEX0206 – The carrying amount at the end of the period

RIN requirements

This section has been completed in accordance with chapter 3, section 3.1 of the Benchmarking RIN Instructions and Definitions.

Consistent with the RIN requirements[11], unless stated otherwise all opening and closing amounts reported reconcile to the Balance Sheet forming part of the Regulatory Financial Statements. In instances where a difference exists an explanation and reconciliation has been provided.

Table 3.2 has been populated with actual data and then disaggregated as described in the *Methodology and Assumptions* section below.

Source

All financial information required to complete this table was sourced from Powerlink's Statutory and Regulatory Financial Statements, Payroll reports and general ledger. In instances where a difference exists an explanation and reconciliation has been provided.

Methodology and assumptions

Powerlink has reported its provisions based on the categories disclosed in the Provision Reconciliation schedule forming part of the Regulatory Financial Statements submitted to the AER each year.

Powerlink's methodology (refer below) used to disaggregate the provision balances between Regulated and Non-regulated services and Opex and Capex has been applied on a year by year basis. In instances where the disaggregation ratio differs from the previous year the opening balance has been amended to reflect the ratio for that reporting year. This has resulted in some instances of the closing balance for one year differing from the opening balance for the subsequent year. This approach ensures that the movement in the provision balances is preserved for the purposes of the RIN reporting. Powerlink has provided a reconciliation in the spreadsheet attached to this document.

The methodologies utilised to disaggregate the provision balances between Regulated and Non-Regulated and Opex and Capex are detailed below:

Employees Entitlements
Powerlink has utilised the labour time charged to Regulated and Non-Regulated activities to disaggregate the Employee Entitlements provisions between Regulated and Non-Regulated

[11] Australian Energy Regulator (2013a). p.18.

activities. The Regulated provision balances were then apportioned between Opex and Capex based on the labour time charged to Opex and Capex activities.

For line items *TOPEX0205A & TOPEX0211A "the increase during the period in the discounted amount arising from the passage of time and the effect of any change in the discount rate",* Powerlink has used the financial impact of the statutory adjustment as required by Australian Accounting Standards as the basis of reporting.

Environmental Restoration
Environmental Restoration provisions relate only to Regulated Opex maintenance activities.

Others
Other Provisions include both the Organisation Restructure and Onerous Leases provisions[12] which relate only to Regulated Opex.

Dividends
The provision for Dividends has been allocated between Regulated and Non-Regulated in accordance with the apportionment of Powerlink's fixed asset base as reported in the Regulatory Financial Statements disaggregated Balance Sheet for each financial year submitted to the AER.

[12] See note 19 to Powerlink's Financial Statements 2012/13.

Sheet: 4. Assets (RAB)

Table: 4.1 Regulatory Asset Base Values

Variable*: *TRAB0101 – Opening value
TRAB0102 – Inflation addition
TRAB0103 – Straight line depreciation
TRAB0104 – Regulatory depreciation
TRAB0105 – Actual additions (recognised in RAB)
TRAB0106 – Disposals
TRAB0107 – Closing value for asset value

RIN requirements

This section has been completed in accordance with chapter 4 of the Benchmarking RIN Definitions and Instructions.

Consistent with the RIN requirements[13], unless stated otherwise all amounts reported reconcile to the final Roll Forward Model (RFM) used to establish Powerlink's Regulatory Asset base for each of the relevant regulatory periods and the Regulatory Financial Statements submitted to the AER annually. In instances where a difference exists an explanation and reconciliation has been provided.

Table 4.1 has been populated with actual data for additions and disposals. Other variables have been populated with information calculated using the functionality contained within the AER's RFM.

Source

All information required to complete this table was sourced from the final RFM used to establish Powerlink's Regulatory Asset base for each of the relevant regulatory periods and the Regulatory Financial Statements submitted to the AER annually. Powerlink used the RFM for the period 2008 – 2012 as a base to create a fresh model for the regulatory period commencing 2012/13.

Methodology and assumptions

In re-categorising the substation land assets Powerlink reviewed its land assets and aligned them to the RIN requirements using actual usage.

Financial Years 2006 and 2007

Powerlink used the RFM submitted to the AER as part of the 2007/08 – 2011/12 Transmission Determination process as the initial commencement point and made the following adjustments:

- Replaced 2007 forecast figures with actual Capex and disposals.
- The functionality within the RFM does not cater for the recalculation of regulatory depreciation following the replacement of the forecast capex and disposals amounts

[13] Australian Energy Regulator (2013a). p.20.

with actual figures. Therefore, the original regulatory depreciation forecast amounts in the RFM have been used.

Powerlink notes that the original model included 2006/07 as forecast values and therefore the substitution for actuals will produce a different closing balance than what was then used for the opening position in the 2006/07 – 2011/12 RFM. A reconciliation has been provided.

Financial Years 2008 to 2012

Powerlink used the RFM submitted to the AER as part of the 2011/12 – 2016/17 Transmission Determination process. As discussed above, Powerlink has elected to retain the opening position as per the Determination in order to maintain the functionality of the model and has made the following adjustments:

- Replaced 2012 forecast figures with actual Capex and disposals.

The opening balance for the 2007/08 year does not align to the closing balance of the 2006/07 year due to the use of actual 2006/07 results which replace the 2006/07 forecast used in the RFM.

Financial Year 2013

Powerlink used the RFM for the period 2008 – 2012 as a base to create a model for the regulatory period commencing 2012/13 and refreshed all necessary fields to allow the model to function for the next regulatory period. The RFM has been originally designed to cater for "RAB as incurred" but the Economic Benchmarking Regulatory Information Notice ("EB RIN") requires "RAB as commissioned" information. Powerlink has therefore added functionality to the model to enable it to be rolled forward on a "RAB as commissioned" basis.

The opening balance for the 2012/13 year does not align to the closing balance of the 2011/12 year due to:

- The use of actual 2011/12 results which replace the forecasts used in the RFM.
- The use of actual CPI for the 2011/12 year.
- The recognition of the true-up for the 2006/07 year with the accompanying return on difference adjustment.

As determined in the Final Decision for Powerlink's 2012/13 to 2016/17 Revenue Determination, Powerlink has applied a redistribution of the RAB asset classes into the RAB opening balance for the 2012/13 year.

Reconciliation of RAB reported in RFM to RAB reported in EB RIN

Asset category	Nominal ($,000) 2003-	2005-	2006-	2007-	2008-	2009-	2010-	2011-	2012-
Closing Balance Powerlink		3,017,009	3,204,880	3,896,671	4,477,146	4,885,968	5,300,210	5,654,954	6,034,755
Closing Balance - Approved RFM		3,007,529	3,239,944	3,896,671	4,477,146	4,885,968	5,300,210	5,633,594	0
Difference		9,480 **(A)**	-35,064 **(B)**	0	0	0	0	21,360 **(C)**	
ABRFM 2001/02 to 2006/07 as approved	**2,852,560**	**3,007,529**	3,033,775						
Add difference between actual and forecast capex			206,169						
RAB (as commissioned) as approved	2,852,560	3,007,529	**3,239,944**						
Powerlink Adjustments									
A: Re-align difference between actual and forecast capex	-57,241	66,722	196,688	Note: information available in the AER model. $9.48 M is 2003/04 & 2004/05					
RAB value - re-aligned		**3,017,010**	**3,239,944**						
Recognise Actual Capex in last year of regulatory Period									
Difference - Actual Capex 06/07			-33,462						
Difference - Actual Disposals 06/07			-1,601						
B: Sub total: difference when substituting actuals for forecasts			-35,063						
Powerlink RAB Closing Balance		**3,017,010**	**3,204,881**						
RFM 2007/08 to 20011/12 as approved				**3,896,671**	**4,477,146**	**4,885,968**	**5,300,210**	**5,633,594**	
Powerlink Adjustments									
Adjustment made to Capital expenditure in 2011/12									
Recognise Actual Capex in last year of prior regulatory Period (06/07)									
Difference - Actual Capex 06/07 (with lagged CPI adjustment in RFM)								32,099	
Difference - Actual Disposals 06/07 (with lagged CPI adjustment in RFM)								1,609	
Sub total: return on difference upto recognition at close of 2011/12								16,988	
								50,696	
Recognise Actual Capex in last year of current regulatory Period (11/12)									
Difference - Actual Capex 11/12								-26,945	
Difference - Actual Disposals 11/12								-4,766	
Sub total: difference when substituting actuals for forecasts								-31,711	
Difference - Inflation adjustment using Actual CPI								2,375	
Difference - Depreciation - not applicable - 1 year lag.									
C: Subtotal 2011/12 adjustments								21,360	
POWERLINK RFM 20012/13 to 2013/14								**5,604,258**	**6,034,755**

Table: 4.2 Asset value roll forward

Variable: ***TRAB0101 – Opening value***
TRAB0102 – Inflation addition
TRAB0103 – Straight line depreciation
TRAB0104 – Regulatory depreciation
TRAB0105 – Actual additions (recognised in RAB)
TRAB0106 – Disposals
TRAB0107 – Closing value for asset value

RIN requirements

This section has been completed in accordance with chapter 4 of the Benchmarking RIN Definitions and Instructions.

Consistent with the RIN requirements[14], unless stated otherwise all amounts reported reconcile to the final RFM used to establish Powerlink's Regulatory Asset base for each of the relevant regulatory periods and the Regulatory Financial Statements submitted to the AER annually. In instances where a difference exists an explanation and reconciliation has been provided.

Table 4.2 has been populated with actual data for additions and disposals. Other variables have been populated with information calculated using the functionality contained within the AER's RFM.

Source

All information required to complete this table was sourced from the final RFM used to establish Powerlink's Regulatory Asset base for each of the relevant regulatory periods and the Regulatory Financial Statements submitted to the AER annually. Powerlink used the RFM for the period 2008 – 2012 as a base to create a fresh model for the regulatory period commencing 2012/13.

Methodology and assumptions

The underlying methodology and resulting financial information used to populate table 4.1 has formed the base to complete table 4.2.

Asset categories used by Powerlink differ from those required to complete table 4.2. As such Powerlink has used the following matrix to align to the RIN requirements:

EB RIN template categories	Powerlink's categories	Assumptions
Overhead Transmission Assets	Transmission Lines - Overhead Transmission Lines – Refit	• No assumptions made
Underground Transmission Assets	Transmission Lines - Underground	• No assumptions made
Transmission switchyards, substations	Substations Primary Plant Insurance Spares Substations Secondary Systems Land - Substations	• Insurance Spares are classified in the same way as Substations Primary Plant • Powerlink owned land has

[14] Australian Energy Regulator (2013a). p.20.

		been disaggregated into three categories being Substations, Other Purposes and Easements.
Easements	Easements Land - Easements	• Powerlink owned land has been disaggregated into three categories being Substations, Other Purposes and Easements.
Other Assets with long lives	Commercial Buildings Communications Other Assets Comms - Civil Works Network Switching Centres Land – Other Equity raising costs	• These asset classes have a useful life of more than 10 years • Equity raising costs are recognised as part of the RAB and are amortised over 43 years. • Powerlink owned land has been disaggregated into three categories being Substations, Other Purposes and Easements.
Other Assets with short lives	Computer Equipment Office Furniture & Miscellaneous Office Machines Vehicles Moveable Plant	• These asset classes have a useful life of less than 10 years

Table: 4.3 Total disaggregated RAB asset values

Variable: ***TRAB0801 – Overhead transmission assets (wires and towers/poles etc)***
TRAB0802 – Underground transmission assets (cables, ducts etc)
TRAB0803 – Substations, switchyards, transformers etc with transmission functions
TRAB0804 – Easements
TRAB0805 – Other assets with long lives (please specify)
TRAB0806 – Other assets with short lives (please specify)

RIN requirements

This section has been completed in accordance with chapter 4 of the Benchmarking RIN Definitions and Instructions.

Table 4.3 has been populated with the information from the preceding tables 4.1 and 4.2.

Source

This table was completed using an average formula of the Opening and Closing values of each category in table 4.2[15].

[15] Australian Energy Regulator (2013a). p.22.

Table: 4.4 Asset Lives

Sub-table: 4.4.1 Asset lives – estimated service life of new assets

Variable: *TRAB0901 – Overhead transmission assets (wires and towers/poles etc)*
TRAB0902 – Underground transmission assets (cables, ducts etc)
TRAB0903 – Switchyards, substations and transformer assets
TRAB0904 – Other assets with long lives (please specify)
TRAB0905 – Other assets with short lives (please specify)

RIN requirements

This section has been completed in accordance with Chapter 4 of the Benchmarking RIN Definitions and Instructions.

Table 4.4.1 has been populated with estimated data.

Source

This table was completed using outputs from the Regulated RFM.

Methodology and assumptions

Consistent with the RIN requirements[16] the weighted average calculation was used and the following assumptions were made:

1) Land and Easements do not have a definite useful life and therefore were excluded from the weighted average calculations.

2) In the weighted average asset life calculation provided in the template Powerlink used the following figures:

EB RIN Requirements	Assumptions
n is the number of assets in category j	Individual asset information is not available within the Regulated RFM, as such Powerlink has substituted the number of asset classes within a category for *n*
$X_{i,j}$ is the value of asset *i* in category *j*	The Nominal Opening Regulatory Asset Base values calculated from the Regulated RFM were used for $X_{i,j}$
$EL_{i,j}$ is the expected life of asset *i* in category *j*	The expected useful lives as contained in the Regulatory RFM per asset class were used for $EL_{i,j}$
RC_j is the sum of the value of all assets in category *j*	No assumptions

[16] Australian Energy Regulator (2013a). p.22.

Table: 4.4 Asset Lives

Sub-table: 4.4.2 Asset lives – estimated residual service life

Variable: *TRAB1001 – Overhead transmission assets (wires and towers/poles etc)*
TRAB1002 – Underground transmission assets (cables, ducts etc)
TRAB1003 – Switchyards, substations and transformer assets
TRAB1004 – Other assets with long lives (please specify)
TRAB1005 – Other assets with short lives (please specify)

RIN requirements

This section has been completed in accordance with Chapter 4 of the Benchmarking RIN Definitions and Instructions.

Table 4.4.2 has been populated with estimated data.

Source

This table was completed using data from Powerlinks Enterprise Resource Planning (ERP) system, SAP, and outputs from the Regulated RFM.

Methodology and assumptions

Estimated residual service life is based on an estimate of the average expended life of each type of asset. This is then subtracted from the corresponding estimated service life of new assets (variables TRAB0901 – TRAB0905) to derive the estimated residual service life.

Why an estimate is required

It is not possible to provide actual data on the residual service life of assets. The actual service life will not be determined until an asset is finally removed from service at the end of its life. While a new asset might be expected to achieve a certain operating life when it is first placed into service, it will be subject to the vagaries of the operating environment in which it is placed and the operating stresses to which it is subjected. The AER has recognised this in the RIN Instructions and Definitions when it has directed Powerlink to report "a current estimation" of the residual service life[17].

How the data was estimated

The method for estimating the average expended life of each type of asset is set out below:

Variables TRAB1001 – TRAB1003

The historical record of the year in which each type of asset was installed was sourced from SAP. A volume weighted average age, based on the count of the number of assets, was then determined for each regulatory year. For example, if there is one substation asset that is one year old, and three assets that are five year old the average age of substation assets is ((1 x 1) + (3 x 5)) / (3 + 1) = 4 years. If the estimated service life of new substation assets is 40 years then the estimated residual life of these substation assets is 40 – 4 = 36 years.

The specific physical equipment that comprises the count of assets for each variable are:

- TRAB1001 Overhead transmission assets – transmission towers;

[17] Australian Energy Regulator (2013a). p.23.

- TRAB1002 Underground transmission assets – underground cable sections; and
- TRAB1003 Switchyard, substation and transformer assets – substation switchbays

Variable TRAB1004 – TRAB1005

The individual assets included in these variables are significantly more diverse than the individual assets in the other variables. For this reason a simple count of asset or equipment numbers is not appropriate and an asset value ($'s) weighted average approach has been adopted.

Asset values and an estimated remaining life for the start of the analysis were sourced from the Regulated RFM. For each subsequent year the existing assets were rolled forward and 'aged' by one year and any increase in asset value was assumed to have the estimated service life of the corresponding asset type (ie variables TRAB0904 – TRAB0905). From this a dollar-weighted average age was determined.

Sheet: 5. Operational data

Table: 5.1 Energy delivery

Variables: TOPED0101, TOPED0102, TOPED0103 - Energy Grouping by Downstream Connection type

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. At each settlement location for transmission networks (TOPED0101), distribution networks (TOPED0102) and directly connected end-users (TOPED0103), customers' energy values are recorded.

Table 5.1 has been populated with actual data.

Source

These recordings are stored in Powerlink's metering database, known as LoadDB, as half hour average demands for each connection point, expressed in MW. As required under the Rules:

- Raw data for TOPED0101 has been provided by AEMO[18]; and
- Data for TOPED0102 and TOPED0103 has been provided by registered Meter Data Providers (MDPs) [19].

Methodology and assumptions

Numbers provided have been processed from raw meter data and are the sum of half hour average MW demands recorded for all connection points over the year. This is then divided by two thousand in order to give a net GWh energy total for each of the variables.

Energy delivered to other connected transmission networks (variable TOPED0101) is calculated as the sum of the absolute value of all energy transfers. That is, gross exported energy plus gross imported energy.

[18] Australian Energy Market Commission, National Electricity Rules, Version 60, January 2014, clause 7.2.1B.

[19] Australian Energy Market Commission, National Electricity Rules, Version 60, January 2014, clause 7.2.5 (c1).

Table: 5.2 Connection point numbers

Variables: TOPCP0101 to TOPCP0104 - Number of entry points at each transmission voltage level

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. Further context is provided by reference to chapter 6 of the *Better Regulation Explanatory Statement: Regulatory Information Notices to Collect Information for Economic Benchmarking* ('the Economic Benchmarking Explanatory Statement').

The Economic Benchmarking RIN Instructions and Definitions requires that:

> Connection point numbers must be reported as the average of connection point numbers in the relevant Regulatory Year under system normal conditions. The average is calculated as the average of the number of connection points on the first day of the Regulatory Year and on the last day of the Regulatory Year.[20]

The AER has clarified that:

> The purpose of our connection point variables is to provide an indicator of the requirements for transmission services a TNSP has to provide at connection points. These services are a necessary part of maintaining the quality, reliability and security of supply.[21]

For these variables, table 5.2 has been populated with actual data. Powerlink has populated four variables in this table for the following voltage levels:

- TOPCP0101: 330 kV
- TOPCP0102: 275 kV
- TOPCP0103: 132 kV
- TOPCP0104: 110 kV

Source

For calculating the number of entry points, Powerlink has used AEMO's List of Regional Boundaries and Marginal Loss Factors report that is published for each financial year[22]. This report documents a marginal loss factor (MLF) for each transmission connected generator in the NEM.

Methodology and assumptions

The number of entry points at the end of a regulatory year has been calculated using the number of unique Transmission Node Identifier (TNI) Codes for Queensland transmission connected generators listed in Appendix A of AEMO's annual List of Regional Boundaries and Marginal Loss Factors report (MLF Report), with the following exceptions:

[20] Australian Energy Regulator (2013a). p.24.
[21] Australian Energy Regulator (2013b). Better Regulation Explanatory Statement, Regulatory Information Notices to Collect Information for Economic Benchmarking, November, p.40.
[22] Available at: http://www.aemo.com.au/Electricity/Market-Operations/Loss-Factors-and-Regional-Boundaries/List-of-Regional-Boundaries-and-Marginal-Loss-Factors-for-the-2013-2014-Financial-Year. Prior to 1 July 2009 this was reported by NEMMCO.

- Where separate commercial entities share a single TNI Code, the separate commercial entities are counted as separate entry points. For example, Braemar Power Station, Braemar Stage 2 Power Station and Darling Downs Power Station all share the TNI Code of QBRA but are counted as three entry points.
- Where power station auxiliary load connections have a TNI Code different from the generating units they support, they are counted as a single entry point. For example, Collinsville PS and Collinsville PS Load have distinct TNI Codes (QCVP and QCVX) but are counted as only one entry point.
- Generating units not connected to Powerlink assets are not counted – for example, Mackay GT connects to the Ergon 33kV bus and is not counted as an entry point.
- Wivenhoe Pumps are not counted separately from Wivenhoe Generation.

The number of entry points at a voltage level in a given regulatory year is taken as the average of:

- The number of entry points at that voltage level determined from the AEMO MLF Report for that regulatory year; and
- The number of entry points at that voltage level determined from the AEMO MLF Report for the previous regulatory year.

Variables: TOPCP0201 to TOPCP0208 - Number of exit points at each transmission voltage level

<u>RIN Requirements</u>

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. Further context is provided by reference to chapter 6 of the Economic Benchmarking Explanatory Statement. Consistent with subsequent instructions issued by the AER, Powerlink has also reported interconnectors as exit points in Table 5.2 and not as entry points[23].

Consistent with the requirements in relation to entry points, the Economic Benchmarking RIN Instructions and Definitions requires that:

> Connection point numbers must be reported as the average of connection point numbers in the relevant Regulatory Year under system normal conditions. The average is calculated as the average of the number of connection points on the first day of the Regulatory Year and on the last day of the Regulatory Year.[24]

For these variables, table 5.2 has been populated with actual data. Powerlink has populated eight variables in this table for the following voltage levels:

- TOPCP0201: 330 kV
- TOPCP0202: 275 kV
- TOPCP0203: 132 kV
- TOPCP0204: 110 kV
- TOPCP0205: 66 kV
- TOPCP0206: 33 kV
- TOPCP0207: 22 kV
- TOPCP0208: 11 kV.

[23] E-mail from AER, EBT RIN – interconnectors and connection point numbers, 12 February 2014.
[24] Australian Energy Regulator (2013a). p.24.

Source

For calculating the number of exit points at the end of a regulatory year Powerlink has used AEMO's annual List of Regional Boundaries and Marginal Loss Factors report, which documents a MLF for each transmission connected load point in the NEM in that regulatory year. As noted above, the AER has stipulated that interconnectors must also be treated as exit points.

Methodology and assumptions

The number of exit points has been calculated as the number of unique TNI Codes for Queensland transmission connected load points listed in Appendix A of AEMO's annual List of Regional Boundaries and Marginal Loss Factors report, with the following exceptions:

- Where separate TNI Codes have been created under the one location to facilitate Full Retail Contestability (where that location may have formerly had a single TNI code), this is still counted as a single exit point. For example, in the 2006/07 report the TNI Code for Woolooga 132kV (QWLG) was replaced with Woolooga Energex (QWLG) and Woolooga Ergon Energy (QWLN).
- Wivenhoe Pumps are not counted as an exit point. The Wivenhoe Power Station connection is already counted as an entry point.
- The QNI and Terranora interconnectors are included as additional exit points.

The number of exit points at a voltage level in a given regulatory year is taken as the average of:

- The number of exit points at that voltage level determined from the AEMO MLF Report for that regulatory year; and
- The number of exit points at that voltage level determined from the AEMO MLF Report for the previous regulatory year.

Table: 5.3 System Demand

Sub-table: 5.3.1 Annual system maximum demand characteristics – MW measure

Variable: TOPSD0101 - Transmission system coincident maximum demand (MW)

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. The definition of Transmission System Coincident Maximum Demand set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions has been applied.

For this variable, table 5.3.1 has been populated with actual data.

Source

The variable has been populated with actual information from the same source used for variables in Table 5.1 (Energy Delivery).

Methodology and assumptions

The reported value is the build-up of two major components:

- the summation of the actual unadjusted (i.e. not weather normalised) MW demands at Powerlink's downstream connection and supply locations at the time when this summation is greatest; and
- any export at the time of the coincident maximum for each interconnector (consistent with the definition set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions).

Variable: TOPSD0102 - Transmission System coincident weather adjusted maximum demand 10% POE (MW)

As permitted under the RIN[25], Powerlink has not populated this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable and it would be onerous to develop and provide a historical record.

Powerlink is currently developing its temperature correction methodology to capture the relationship between weather variables and demand. It will therefore be possible to populate this variable in future.

Variable: TOPSD0103 - Transmission System coincident weather adjusted maximum demand 50% POE (MW)

RIN Requirements

This section has been completed in accordance with the definition of Transmission System Coincident Weather Adjusted Maximum Demand 50% POE set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions.

[25] Australian Energy Regulator (2013a). pp. 6-7.

For this variable, table 5.3.1 has been populated with estimated data. While this variable is based on actual data, being the non weather adjusted maximum demand, it is also materially dependent on judgments and assumptions in developing the methodology for weather adjustment. As there is no independent means of verifying the correctness or otherwise of historical weather adjustment Powerlink considers this variable will remain as estimated data in the future.

Source

Historically, Powerlink had collected this data for a 50% POE (but not 10% POE), which was the more common reporting measure for NSPs under their Transmission Annual Planning Reports (TAPR). The variable has therefore been populated based on temperature corrected data calculated in accordance with the methodology documented in Powerlink's 2012 TAPR[26], along with actual information from the variable Transmission System coincident maximum demand (TOPSD0101).

Methodology and assumptions

In order to report a delivered value for Transmission System coincident weather adjusted maximum demand 50% POE up to 2011/12, the difference between corrected and uncorrected native state peak demand has been added to the Transmission System coincident maximum demand reported in TOPSD0101.

Powerlink is currently reviewing its temperature correction methodology that models the relationship between weather variables and demand. It is possible that weather adjusted maximum demands will change in future RIN returns following this review.

Variable: TOPSD0104 - Transmission system non-coincident summated maximum demand (MW)

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. The definition of Transmission System Non-Coincident Summated Maximum Demand set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions has been applied.

For this variable, table 5.3.1 has been populated with actual data.

Source

The variable has been populated with actual information from the same source used for variables in section 5.1 (Energy Delivery).

Methodology and assumptions

The reported value is the build-up of two major components:

[26] Refer: http://www.powerlink.com.au/About_Powerlink/Publications/Annual_Planning_Reports/Annual_Planning_Report_2012.aspx, Table 2.8, p.30 and Appendix A.

- the actual unadjusted (i.e. not weather normalised) summation of actual MW demands at Powerlink's downstream connection and supply locations irrespective of when they occurred in the year; and
- the highest export value for each interconnector for each year, irrespective of when they occurred (consistent with the definition set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions).

Variable: TOPSD0105 - Transmission System non-coincident weather adjusted summated maximum demand 10% POE (MW)

As permitted under the RIN[27], Powerlink has not populated the templates for this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable and it would be onerous to develop and provide a historical record.

Variable: TOPSD0106 - Transmission System non-coincident weather adjusted summated maximum demand 50% POE (MW)

As permitted under the RIN[28], Powerlink has not populated the templates for this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable, and it would be onerous to develop and provide a historical record.

[27] Australian Energy Regulator (2013a). pp. 6-7.
[28] Australian Energy Regulator (2013a). pp. 6-7.

Sub-table: **5.3.2 Annual system maximum demand characteristics – MVA measure**

Variable: ***TOPSD0201 - Transmission system coincident maximum demand (MVA)***

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. The definition of Transmission System Coincident Maximum Demand set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions has been applied.

For this variable, table 5.3.2 has been populated with actual data.

Source

MW and MVAr values were sourced from the same data used for Table 5.1 (Energy Delivery) and Sub-table 5.3.1 (Annual System Maximum Demand Characteristics – MW measure). Due to historical metering configurations set up for recording MVAr data at the connection points listed below, no recorded data has been sent by the MDP.

Woolooga(Ergon)	01/07/2005 – 31/08/2007
Tarong(SW)	01/07/2005 – 19/12/2009
Middle Ridge(SW)	01/07/2005 – 29/03/2008
Clare	01/07/2005 – 30/09/2009
Belmont	01/07/2005 – 19/12/2006
Brisbane CBD	01/07/2005 – 30/06/2010
Rocklea (CBD)	01/07/2005 – 30/06/2010
Lilyvale (132kV)	01/07/2005 – 30/06/2013

For these connection points, SCADA data has been used instead. SCADA data is sent through a separate channel of communication to that of meter data. Values are recorded throughout the network by calibrated current and instrumentation transformers connected to Powerlink's secondary systems communications network. These numbers are used for real time monitoring of the network. They are also passed into a database which stores all historic readings from these transformers.

The SCADA data was extracted to have the same time resolution as that of the meter data provided by the MDP.

Methodology and assumptions

MVA figures are calculated using MW and MVAr values for each half hour period for each year.

The reported value is a build up of two major components:

- the summation of actual unadjusted (i.e. not weather normalised) MVA demands at Powerlink's downstream connection and supply locations at the time when this summation is greatest; and
- any export at the time of the coincident maximum demand for each interconnector (consistent with the definition set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions).

Variable: TOPSD0202 - Transmission System coincident weather adjusted maximum demand 10% POE (MVA)

As permitted under the RIN[29], Powerlink has not populated the templates for this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable, and it would be onerous to develop and provide a historical record.

Variable: TOPSD0203 - Transmission System coincident weather adjusted maximum demand 50% POE (MVA)

As permitted under the RIN[30], Powerlink has not populated the templates for this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable, and it would be onerous to develop and provide a historical record.

Variable: TOPSD0204 - Transmission system non-coincident summated maximum demand (MVA)

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions. The definition of Transmission System Non-Coincident Summated Maximum Demand set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions has been applied.

For this variable, table 5.3.2 has been populated with actual data.

Source

MVA values were sourced from the same data used to populate variable TOPSD0201 (Transmission System coincident maximum demand).

Methodology and assumptions

The reported value is a build up of two major components:

- the actual unadjusted (i.e. not weather normalised) summation of actual MVA demands at Powerlink's downstream connection and supply locations irrespective of when they occurred in the year; and
- the highest export value of each interconnector for each year, irrespective of when they occurred (consistent with the definition set out in chapter 9 of the Economic Benchmarking RIN Instructions and Definitions).

[29] Australian Energy Regulator (2013a). pp. 6-7.
[30] Australian Energy Regulator (2013a). pp. 6-7.

Variable: TOPSD0205 - Transmission System non-coincident weather adjusted summated maximum demand 10% POE (MVA)

As permitted under the RIN[31], Powerlink has not populated this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable, and it would be onerous to develop and provide a historical record.

Variable: TOPSD0206 - Transmission System non-coincident weather adjusted summated maximum demand 50% POE (MVA)

As permitted under the RIN[32], Powerlink has not populated this variable and the cells have therefore been blacked out. Powerlink has not previously calculated this variable, and it would be onerous to develop and provide a historical record.

[31] Australian Energy Regulator (2013a). pp. 6-7.
[32] Australian Energy Regulator (2013a). pp. 6-7.

Sub-table: 5.3.3 Power factor conversion between MVA and MW

Variable: TOPSD0301 - Average overall network power factor conversion between MVA and MW

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions.

For this variable, table 5.3.3 has been populated with actual data.

Source

Reported values have used data sources from Sub-tables 5.3.1 and 5.3.2 of this Basis of Preparation document to calculate power factor.

Methodology and assumptions

Power factor has been calculated by dividing:

- variable TOPSD0101 (Transmission System coincident maximum demand – MW); by
- variable TOPSD0201[33] (Transmission System coincident maximum demand – MVA).

Variables: TOPSD0302 to TOPSD0311: Average power factor conversion at each transmission voltage level

RIN Requirements

This section has been completed in accordance with chapter 5, section 5.1 of the Economic Benchmarking RIN Instructions and Definitions.

For these variables, table 5.3.3 has been populated with actual data.

As permitted under the RIN[34], values of zero have been provided for the following variables as Powerlink does not have any lines of this voltage:

- TOPSD0302 (500 kV lines)
- TOPSD0305 (220 kV lines).

Source

Reported values have used data sources from Sub-tables 5.3.1 and 5.3.2 of this Basis of Preparation document to calculate Power Factor.

[33] As MW is much greater than MVAr at the time of regional coincident MW peak, MW and MVA coincident peaks at a regional level invariably occur at the same time.
[34] Australian Energy Regulator (2013a). p.6.

Methodology and assumptions

Each connection point has been assigned its voltage level as seen at its respective settlement location (as per AEMO's annual List of Regional Boundaries and Marginal Loss Factors report). This is the same voltage classification as for variables TOPCP0201 – TOPCP0208.

Power factor has then been calculated for each voltage level (variable) by dividing:

- the summated total MW for all connection points of that voltage at the time of coincident maximum demand; by
- the summated total MVA for the same connection points at the same time.

Sheet: 6. Physical Assets

Table: 6.1 Transmission System Capacities Variables

Sub-table: 6.1.1 Overhead network length of circuit at each voltage

Variables: TPA0101 to TPA0108

RIN requirements

This sub-table has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

Table 6.1.1 has been populated with actual data.

As permitted under the RIN, zero values have been provided where the voltage information is not applicable.

Source

This data has been sourced from the Statistical Summary section of Powerlink's Annual Report 2012/2013 for years 2009-2013 and Powerlink's Annual Report 2008/2009 for years 2006-2008.

Methodology and assumptions

The voltage used for the variable is the "as constructed" voltage.

The RIN template has been populated with data extracted from Powerlink's enterprise resource planning database, SAP. The extraction is based on a list of all in-service, above ground, built sections[35] and the "as constructed" voltage associated with each built section. Data extracted for each built section includes voltage and circuit length.

[35] Powerlink uses "built sections" as the basic building block against which transmission line circuit and easement information is recorded. A "built section" is defined as a collection of structures, conductors and easements with common characteristics as listed in SAP.

Sub-table: 6.1.2 Underground cable circuit length at each voltage

Variables: TPA0201 to TPA0208

RIN requirements

This sub-table has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

Table 6.1.2 has been populated with actual data.

As permitted under the RIN, zero values have been provided where the voltage information is not applicable.

Source

This data has been sourced from the Statistical Summary section in Powerlink's Annual Report 2012/2013 for years 2009-2013 and Powerlink's Annual Report 2008/2009 for years 2006-2008.

Methodology and assumptions

The voltage used for the variable is the "as constructed" voltage.

The RIN templates have been populated with data extracted from Powerlink's enterprise resource planning database, SAP. The extraction is based on a list of all in-service, underground, built sections[36]and the "as constructed" voltage associated with each built section. Data extracted for each built section includes voltage and circuit length.

[36] Ibid.

Sub-table: 6.1.3 Estimated overhead network weighted average MVA capacity by voltage class

Variables: TPA0301 to TPA0308

RIN requirements

This sub-table has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

Table 6.1.3 has been populated with actual data for year 2013. An estimate has been provided for all other years.

Source

The data is sourced from Powerlink's internal ratings database, the Transmission Network Database (TNDB). This database is used as the source for loading Powerlink's Energy Management System with ratings information for operating the transmission network.

Methodology and assumptions: 2013

For actual MVA capacity by voltage data, corresponding ratings data was extracted from TNDB, including total circuit kilometres and summer normal MVA. The summer weighted MVA was derived by multiplying total circuit kilometres by summer normal MVA. For each voltage class the sum of the Summer Weighted MVA was divided by the sum of the total circuit kilometres to arrive at the Weighted Average MVA capacity.

Powerlink's ratings database records information on system voltage, not rated voltage. Normal summer ratings have been provided in the templates in accordance with section 6.1 of the Benchmarking RIN Instructions and Definitions[37] as Powerlink's transmission network experiences its maximum demand during summer.

The thermal ratings used are based on the summer normal thermal limits applied to individual lines/cables which is the maximum that would be permitted under normal operating conditions. Transient and voltage stability limits are managed from a system perspective, rather than on individual line/cable, with constraint equations applied to different grid sections, consisting of many lines at different voltages, of the system which may introduce limitations on thermal ratings.

Why an estimate is required: 2006-2012

Estimates are provided for 2006-2012 as historical ratings data was not retained in Powerlink's ratings database.

How the estimate has been produced: 2006-2012

As the ratings of any given overhead cables do not change significantly through time, Powerlink has derived an estimate based on its actual ratings for 2013. This approach assumes that ratings have remained static from 2006. Applying these ratings values, any newly commissioned lines in each year of that period were also taken into account.

[37] Australian Energy Regulator (2013a). p.26.

The relevant information for newly commissioned lines was assigned to the appropriate year based on the actual commissioning date.

At this time, Powerlink considers that this methodology provides its best estimate of historical ratings as it utilises a combination of actual data and historical data from SAP.

Sub-table: 6.1.4 Estimated underground network weighted average MVA capacity by voltage class

Variables: TPA0401 to TPA0408

RIN requirements

This sub-table has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

Table 6.1.4 has been populated with actual data for year 2013. An estimate has been recorded for all other years.

Source

The data is sourced from Powerlink's internal ratings database (TNDB). This database is used as the source for loading Powerlink's Energy Management System with ratings information for operating the transmission network.

Methodology and assumptions: 2013

For actual MVA capacity by voltage data, corresponding ratings data was extracted from TNDB including total circuit kilometres and summer normal MVA. The summer weighted MVA was derived by multiplying total circuit kilometres by summer normal MVA. For each voltage class the sum of the summer weighted MVA was divided by the sum of the total circuit kilometres to arrive at the weighted average MVA capacity.

Powerlink's ratings database records information on system voltage, not rated voltage. Normal summer ratings have been provided in the templates in accordance with section 6.1 of the Benchmarking RIN Instructions and Definitions[38], as Powerlink's transmission network experiences its maximum demand during summer.

The table has been populated with estimated data for all years prior to 2013. Powerlink's ratings database records information on system voltage, not rated voltage.

Why an estimate is required: 2006-2012

Estimates are provided for 2006-2012 as historical ratings data were not retained in Powerlink's ratings database.

How the estimate has been produced: 2006-2012

The data is derived from Powerlink's actual ratings for 2013. For years prior to 2013, Powerlink commenced its estimation process with the actual ratings values for 2013.

Powerlink's internal engineering records and Annual Reports confirm that its underground network has remained stable from 2006 to 2013, with the only exception being the cables commissioned in 2010. The MVA capacity values for years preceding 2010 take this change into account.

[38] Australian Energy Regulator (2013a). p.26.

Given that it operates a small high voltage cable network, Powerlink considers that this methodology provides its best estimate of average MVA capacity for the years 2006 to 2013.

Sub-table: 6.1.5 Installed transmission system transformer capacity

Variables: TPA0501, TPA0502, TPA0503, TPA0505 and TPA0506

RIN requirements

This sub-table has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

Table 6.1.5 has been populated with actual data.

Source

The data has been sourced directly from Powerlink's corporate enterprise resource planning database, SAP.

Methodology and assumptions

A list of Powerlink owned transformer equipment records, associated commissioning and decommissioning dates, and capacity information was extracted for each power transformer from SAP. For each transformer in the list, Powerlink used its high voltage system operating diagrams to identify which variable category was appropriate (consistent with Benchmarking RIN Instruction and Definitions, chapter 9[39]).

Since the network connection from Millmerran to Middle Ridge was established in 2004, Powerlink's 330/275kV transformers are imbedded within the transmission network and are included as part of variable TPA0501, not TPA0505.

Given the large number of SVC transformers on Powerlink's network, a separate SVC transformer variable category has been included in the RIN template to improve granularity as these transformers do not fit well into the other template variable categories provided.

For years prior to 2013, commissioning and decommissioning dates from the above report were used to calculate yearly totals.

Variable: TPA0504 - Transformer capacity for directly connected end–users owned by the end–user

RIN Requirements

This section has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 6.1.5 has been populated with estimates for all years.

Source

The data is sourced from Powerlink's high voltage system operating diagrams.

[39] Australian Energy Regulator (2013a). p.38.

Why an estimate is required

Estimates are provided as historical data on end-user transformer ratings is not required to operate Powerlink's transmission network and has therefore not been collected.

How the estimate has been produced

For all years, ratings data from Powerlink's high voltage system operating diagrams have been used. For years prior to 2013, the commissioning date of feeders or switching bays that connect to the end-user (from SAP) was used.

Powerlink considers that this methodology provides its best estimate for end-user transformer capacity.

Sub-table: 6.1.6 Cold Spare Capacity

Variable: TPA06

RIN requirements

This sub-table has been completed in accordance with chapter 6, section 6.1 of the Benchmarking RIN Instructions and Definitions.

Table 6.1.6 has been populated with actual data.

Source

The data has been sourced directly from Powerlink's corporate enterprise resource planning database, SAP.

Methodology and assumptions

A list of Powerlink-owned transformer equipment records, installation status and capacity information was extracted for each power transformer from SAP to identify the transformers kept as cold spares.

Sheet: 7 Quality of Service

Table: 7.1 Service Component

Sub-table: 7.1.1 Service Parameter 1 – Average Circuit Outage Rate

Variables: ***TQS0101 - Lines outage rate - fault***
TQS0102 - Number of Lines fault outages
TQS0103 - Number of defined Lines
TQS0104 - Transformers outage rate - fault
TQS0105 - Number of Transformer fault outages
TQS0106 - Number of defined Transformers
TQS0107 - Reactive plant outage rate - fault
TQS0108 - Number of Reactive plant fault outages
TQS0109 - Number of defined Reactive plant
TQS0110 - Lines outage rate – forced outage
TQS0111 - Number of Lines forced outages
TQS0112 - Transformer outage rate – forced outage
TQS0113 - Number of Transformers forced outages
TQS0114 - Reactive plant outage rate – forced outage
TQS0115 - Number of Reactive plant forced outages

RIN requirements

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012[40] electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[41]

Table 7.1.1 has been populated with actual and estimated data.

For clarification, all data reported in the sheet 7 templates on the quality of services relates to calendar years, consistent with the AER's STPIS reporting periods[42].

Source

Information has been sourced from Powerlink's internal network operating systems. Powerlink collects, records and maintains defined transmission circuit outage data and transmission circuit counts, consistent with the AER's STPIS. The information provided in this RIN has been prepared using the actual dataset upon which Powerlink's annual STPIS reports from calendar year 2007 to 2013 were based.

Powerlink's actual calendar year 2006 outage data was also supplied to, and reviewed by, the AER during Powerlink's regulatory determination process for the 2007/08 to 2011/12 regulatory period. This data forms the basis of Powerlink's RIN data for 2006.

Actual data has been used to determine fault outage rates.

---

[40] This is referred to as Version 4 (V4) of the AER's STPIS.
[41] Australian Energy Regulator (2013a). p.29.
[42] Economic Benchmarking RIN STPIS Variables, email from the AER, 6 December 2013.

Estimated data has been used for determining forced outage rates.

Powerlink's historic transmission element outage data has been used as the source for the number of events per annum.

The total number of elements for each reporting year was determined by averaging the number of elements as at 1 January and 31 December of each reporting year.

For clarification, Powerlink is currently subject to Version 3 of the STPIS up to 30 June 2017.

<u>Methodology and assumptions</u>

The average circuit outage rate data is based on a calendar year measurement period, for consistency with the AER's STPIS reporting years.

Powerlink has estimated the forced outage rates for all three circuit types – lines, transformers, reactive plant - for 2006 to 2013. Specifically, Powerlink has made assumptions for determining which outages may be classified as forced outages.

The methodology applied is as follows:

- The AER requires that transmission element outage records exclude any outages of elements as per the STPIS Average element outage rate parameter definition exclusions[43].

- Powerlink has assessed each element outage record against the AER's STPIS V4 criteria for a "fault outage" or "forced outage" using the following approach:

  - A "Fault Outage" is:

    - Any element outage that occurs as a result of unexpected automatic operation of switching devices. That is, the element outage did not occur as a result of intentional manual operation of switching devices.

  - A "Forced Outage" is:
    - Any element outage that occurs as a result of intentional manual operation of switching devices based on the requirement to undertake urgent and unplanned corrective activity where less than 24 hours' notice was given to affected customers and/or AEMO. The notification time is determined by:

      - Time between "Actual Element Outage Start Time" and time advised to affected customers identified by Powerlink's "Application for Work (AFW)[44] Created Time", including
      - Time between "Actual Element Outage Start Time" and time advised to AEMO identified as "AEMO NOS Submit Time[45]",

---

[43] Australian Energy Regulator (2012). Final Decision – Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme, December, p22. Note – for clarity, given that the AER's STPIS references to 'circuits' actually comprise various 'elements' (eg. lines, transformers and reactive plant), Powerlink has referred to these as 'elements' in this document.

[44] An Application for Work (AFW) is an internal Powerlink document which is created for all planned works associated with Powerlink plant and equipment.

- The actual number of *fault* outages per annum and the actual number of element counts were used to calculate the *fault* outage rate for each of the element transmission types – line, transformer and reactive plant.

- The estimated number of *forced* outages per annum and the actual number of element counts were used to calculate the *forced* outage rate for each of the element transmission types – line, transformer and reactive plant.

Why an estimate is required

While Powerlink has collected, recorded and maintained planned and unplanned transmission circuit outage information/data, attributes associated with the concept of a *forced* outage have not been collected or recorded against outage records. These records were developed for non-STPIS reporting purposes. Therefore, to meet RIN requirements, estimates have been developed.

How the estimate has been produced

In Powerlink's outage record systems, potential *forced* outage events have been recorded as planned outages, based on the stance that they exist in a planned environment.

To estimate the number of forced outage events, Powerlink adopted the following approach:

- Determined whether the outage notification was prepared within 24 hours of the actual outage start date and time.
- Assessed each for those outage records with less than 24 hours' planned notice for whether it was an urgent and unplanned corrective activity. This assessment required engineering judgement of the proposed work.

For 2006 to 2013 the annual *forced* outage rate per circuit type was calculated by dividing the estimated number of forced outage events by the actual element count for each circuit type, per annum.

[45] In AEMO's NOS system, Powerlink submits notification of outage and the submitted time is recorded.

Sub-table: 7.1.2 Service Parameter 2 – Loss of Supply Event Frequency

Variables: ***TQS0116 - Number of events greater than 0.2 system minutes per annum***
TQS0116 - Number of events greater than 0.1 system minutes per annum
TQS0117 - Number of events greater than 1.0 system minutes per annum
TQS0117 - Number of events greater than 0.75 system minutes per annum

RIN requirements

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012 electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[46]

Table 7.1.2 has been populated with actual data.

Source

Information has been sourced from Powerlink's internal network operating systems. Powerlink collects, records and maintains defined transmission circuit outage data and transmission circuit counts, consistent with the AER's STPIS. The information provided in this RIN has been prepared using the actual dataset upon which Powerlink's annual STPIS reports from calendar year 2007 to 2013 were based.

Powerlink's actual calendar year 2006 outage data was also supplied to, and reviewed by, the AER during Powerlink's regulatory determination process for the 2007/08 to 2011/12 regulatory period. This data forms the basis of Powerlink's RIN data for 2006.

Powerlink's historic transmission circuit outage data has been used as the source for the number of events per annum.

Data on the total number of circuit elements was sourced from Powerlink's internal network operating systems as at 31 December of each reporting year.

For clarification, Powerlink is currently subject to Version 3 of the STPIS up to 30 June 2017.

The loss of supply event records have been used as the source for the loss of supply event duration and event counts.

Methodology and assumptions

The Economic Benchmarking RIN Instructions and Definitions specifies that:

> Powerlink must enter the loss of supply event frequency thresholds x and y in cells B23 and B24. Where the loss of supply event frequency thresholds have changed, Powerlink must specify all loss of supply event frequency thresholds that applied in the period and the years to which they applied.[47]

[46] Australian Energy Regulator (2013a). p.29.
[47] Australian Energy Regulator (2013a). p.29

Accordingly, Powerlink has added two additional loss of supply event frequency threshold rows into the RIN template to indicate the thresholds that applied to Powerlink's network performance in the current and previous regulatory periods. Further clarification of these thresholds and regulatory periods is provided in the table below:

2005/06 to 2006/07 service standards reporting period	>0.2 system minutes >1.0 system minutes
2007/08 to 2011/12 regulatory period (1 July 2007 to 30 June 2012)	>0.2 system minutes >1.0 system minutes
2012/13 to 2016/17 regulatory period (1 July 2012 to 30 June 2017)	>0.1 system minutes >0.75 system minutes

The methodology applied is as follows:

- The AER requires that loss of supply event records exclude any outages of circuits as per the STPIS Loss of supply event frequency parameter definition exclusions[48].

- Each loss of supply event record contains a "System Minutes Lost" value. If the value of "System Minutes Lost" of any loss of supply event exceeds the "x system minute" and/or "y system minute" thresholds, then a count of "1" is added to each applicable threshold, indicating one count for the applicable reportable loss of supply event threshold. Powerlink's historic loss of supply event "Number of Events" data were used to count the number of reportable events for each loss of supply event frequency threshold category that is required by the RIN template.

<u>Zero values</u>

Powerlink has entered zero values in red font for variables TQS0116 and TQS0117 to indicate that these thresholds were not applicable to those years.

[48] Australian Energy Regulator (2012). p24.

Sub-table: 7.1.3 Service Parameter 3 – Average Outage Duration

Variable: TQS0118 - Average outage duration

RIN requirements

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012 electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[49]

Table 7.1.3 has been populated with actual data.

Source

Information has been sourced from Powerlink's internal network operating systems. Powerlink collects, records and maintains defined transmission circuit outage data and transmission circuit counts, consistent with the AER's STPIS. The information provided in this RIN has been prepared using the actual dataset upon which Powerlink's annual STPIS reports from calendar year 2007 to 2013 were based.

Powerlink's actual calendar year 2006 outage data was also supplied to, and reviewed by, the AER during Powerlink's regulatory determination process for the 2007/08 to 2011/12 regulatory period. This data forms the basis of Powerlink's RIN data for 2006.

Powerlink's historic transmission element outage data has been used as the source for the number of events per annum.

Data on the total number of elements was sourced from Powerlink's internal network operating systems as at 31 December of each reporting year.

For clarification, Powerlink is currently subject to Version 3 of the STPIS up to 30 June 2017.

The loss of supply event records have been used as the source for the loss of supply event duration and event counts.

Methodology and assumptions

The methodology applied is as follows:

- Powerlink's loss of supply event records exclude any outages of elements as per the AER's STPIS Average outage duration parameter definition exclusions[50].

- The loss of supply event data contains "Supply Outage Duration in minutes" data and the longest duration record for each event was used to sum all reportable loss of supply outage event duration times annually. This record was also used to count the number of all reportable loss of supply outage events annually.

[49] Australian Energy Regulator (2013a). p.29.
[50] Australian Energy Regulator (2012). p25.

- The annual average outage duration was calculated by dividing the cumulative summation of the loss of supply event duration time for the period by the number of loss of supply events.

Sub-table: 7.1.4 Service Parameter 4 – Proper Operation of equipment – Number of failure events

Variable: TQS0119 - Failure of Protection System

RIN requirements

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012 electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[51]

For this variable, table 7.1.4 has been populated with actual data.

Source

Information has been sourced from Powerlink's internal network operations systems. Powerlink analyses the performance of protection systems as part of its analysis of unplanned outage events. The performance of the protection systems is recorded with the associated unplanned outage event data.

The unplanned outage event records provided in response to table 7.1.1 of the RIN template were used as the source for the protection system failure event counts.

Methodology and assumptions

The methodology applied for the failure of protection system data is as follows:

- Any recorded failure/s of a protection system in an unplanned outage event record associated with assets that are not providing prescribed transmission services were excluded as per the STPIS Proper operation of equipment parameter definition exclusions[52].

- Any recorded failure/s of a protection system in an unplanned outage event record associated with a force majeure event were excluded as per the STPIS Proper operation of equipment parameter definition exclusions[53].

- As part of Powerlink's unplanned outage event analysis and recording process, the operation of systems providing a protection function to high voltage plant and equipment is analysed and recorded. This protection system operation analysis data was used to identify the protection system failure event counts in accordance with the following definition in the AER's December 2012 STPIS Final Decision:

  - … 'protection system failure events' are those events where the relevant protection equipment does not operate for a fault event as designed or where the relevant equipment operates when there is no relevant fault event.[54]

[51] Australian Energy Regulator (2013a). p.29.
[52] Australian Energy Regulator (2012). p26.
[53] Australian Energy Regulator (2012). p26.
[54] Australian Energy Regulator (2012).p.26.

- The unplanned outage event records were used to identify the counts of the number of protection system failures for each event.

- Any failure of primary equipment such as circuit breakers to respond to signals sent by protection or control equipment was not counted as a protection system failure event, as per the Failure of protection system parameter exclusions[55].

- The annual number of protection system failure events was calculated by summing the number of protection system failure events for that year identified for the RIN reportable unplanned outage events.

Variable: TQS0120 - Material Failure of the Supervisory Control and Data Acquisition (SCADA) System

RIN requirements

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012 electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[56]

For this variable, table 7.1.4 has been populated with actual data.

Source

Powerlink receives the SCADA Minutes Lost report from AEMO on a monthly basis. The SCADA Minutes Lost data from AEMO has been used as the source for the SCADA system failure event counts.

Methodology and assumptions

The methodology applied for the material failure of SCADA system data is as follows:

- The SCADA Minutes Lost data from AEMO was used as the source for the material failure of the SCADA system parameter.

- The annual number of SCADA failure events from AEMO's report was counted and used to populate this variable.

[55] Australian Energy Regulator (2012). p27.
[56] Australian Energy Regulator (2013a). p.29.

Variable: TQS0121 - Incorrect Operation Isolation of Primary or Secondary Equipment Data

<u>RIN requirements</u>

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012 electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[57]

For this variable, table 7.1.4 has been populated with estimated data.

<u>Source</u>

Data has been sourced from Powerlink's internal network operating systems associated with recording the incidence of incorrect operational isolation. The records include:

- The occurrence of incorrect operational isolation resulting in an unplanned outage of the transmission network. Actual records of this type are available for the full period of the RIN requested information; and

- The occurrence of incorrect operational isolation that did *not* result in an unplanned outage of the transmission network. Estimates have been used for the occurrence of incorrect operational isolation not resulting in an unplanned outage of the transmission network for the full period of the RIN requested information.

<u>Methodology and assumptions</u>

The methodology applied for the incorrect operational isolation of primary or secondary equipment data is as follows:

- Powerlink assessed each incorrect operational isolation incident record against the AER's definition below:

  > … 'incorrect operational isolation events' are those events where primary or secondary equipment was not been properly isolated during scheduled or emergency maintenance, irrespective of whether an outage occurred as a result[58].

- Where incorrect operational isolation occurred during primary or secondary isolation sequences, the associated record was included in the count for the number of events.

- The number of incorrect operational isolation events was summated for each year.

Powerlink has entered actual data for incorrect operational isolation of primary or secondary equipment events resulting in an unplanned outage.

[57] Australian Energy Regulator (2013a). p.29.
[58] Australian Energy Regulator (2012). p.26.

Powerlink has estimated the number of incorrect operational isolation of primary or secondary equipment events that did *not* result in an unplanned outage. In doing so, Powerlink has assumed that the relationship between an incorrect operational isolation resulting in an unplanned outage and an incorrect operational isolation that did not result in an unplanned outage is consistent over the years.

Why an estimate is required

Powerlink commenced recording incorrect operational isolation incidents that did *not* result in an unplanned outage from calendar year 2011 for non-STPIS reporting purposes. Therefore, Powerlink has developed estimates for the purposes of meeting the RIN requirements.

How the estimate has been produced

Historically, Powerlink's network operating systems recorded incorrect operational isolation incidents resulting in an unplanned outage only. For years 2011 to 2013, Powerlink used internal data relating to incorrect operational isolation incidents that did *not* result in an unplanned outage, to develop a relationship between those operational isolation incidents that *did* result in an unplanned outage.

To estimate the 2006 to 2010 incorrect operational isolation incidents that did *not* result in an unplanned outage, Powerlink used the same proportions developed above for 2011 to 2013 and applied these to 2006 to 2010 actual records for incidents that *did r*esult in an unplanned outage to estimate data to complete the RIN.

The annual total for each year was calculated by adding the estimated value of incorrect operational isolation incidents that did *not* result in an unplanned outage, to the actual records of incorrect operational isolation incidents that did result in an unplanned outage.

Table: 7.2 Market Impact Component

Variable: TQS02 - Market Impact Parameter

RIN requirements

This section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. Section 7.1 states that:

> Quality of services must be reported in accordance with the definitions specified in the December 2012 electricity transmission network service providers service target performance incentive scheme (STPIS) documents.[59]

In preparing this information, Powerlink has also had regard to the AER's Scenario Reference Guide[60].

Table 7.2 has been populated with actual data.

Source

Powerlink is currently subject to Version 3 of the AER's STPIS. Data that was prepared and verified as part of the Powerlink's annual STPIS reports to the AER, which included Powerlink's original submission for early application of the Market Impact Component (MIC) of the STPIS, forms the basis of the data for this RIN.

The MIC data was sourced from AEMO's Market Management System (MMS), which includes AEMO's Network Outage Scheduler (NOS) and Market Notices published by AEMO.

Methodology and assumptions

Powerlink has populated the RIN template consistent with Version 4 of the STPIS. For additional clarity, the AER's Scenario Reference Guide was used to verify the exclusions.

.

[59] Australian Energy Regulator (2013a). p.29.
[60] AER Scenario Reference Guide, email from the AER, 13 December 2013.

Table: 7.3 System losses

Variable: TQS03 - System losses

RIN Requirements

This sub-section has been completed in accordance with chapter 7, section 7.1 of the Economic Benchmarking RIN Instructions and Definitions. This requires system losses to be calculated as:[61]

$$\frac{(Electricity\ inflows - electricity\ outflows)\ \times 100}{electricity\ inflows}$$

Electricity inflows is the total electricity inflow into Powerlink's transmission network including from generation, other connected TNSPs at the connection point, and connected DNSPs as measured by revenue meters.

Electricity outflows is the total electricity outflow into the networks of connected distribution network service providers, other transmission networks and directly connected end-users as measured by revenue meters.[62]

Table 7.3 has been populated with actual data.

Source

The data for electricity inflows has been built up from two calculable components:

1. 'the total electricity inflow into Powerlink's transmission network including from generation .... and connected DNSPs'; and
2. 'other connected TNSPs at the connection point'.

The first component is derived from the annual sent out energy figures from Table 2.10 of Powerlink's Transmission Annual Planning Report 2013 (TAPR 2013).These values have been adjusted to only include transmission connected generation (they have previously included some embedded scheduled generation). As this value has also previously been corrected for Net interconnector flow, in order to capture total electricity inflow the Net Energy delivered to other connected transmission networks (variable TOPED0101) is added back to this value. This represents the total electricity inflows from Queensland-based sources of energy.

The second component is the gross import component of variable TOPED0101. This represents the total electricity inflows from non-Queensland based sources of energy.

The data for electricity outflows has been built up from two calculable components:

1. 'the total electricity outflow into the networks of connected distribution network service providers' as well as 'and directly connected end-users'; and
2. 'other connected TNSPs at the connection point'.

[61] Australian Energy Regulator (2013a). p.30.
[62] Australian Energy Regulator (2013a). p.30.

To capture the first component the energy delivery to Distribution networks (variable TOPED102) and to Directly connected end users (variable TOPED103) are used. This represents the total electricity outflows to Queensland based consumers of energy.

The second component is the gross export component of variable TOPED0101. This represents the total electricity outflows to non-Queensland based consumers of energy.

Methodology and assumptions

Losses have been calculated in accordance with the formula set out in chapter 7 of the Benchmarking RIN Instructions and Definitions.

Sheet: 8 Operating Environmental Factors

Table: 8.1 Terrain Factors

Variable TEF0101 - Total number of vegetation maintenance spans

As permitted under the RIN[63], Powerlink has not populated the templates for this variable for years 2009 to 2012, and the cells have therefore been blacked out. Powerlink has not previously calculated this variable and it would be onerous to develop and provide a historical record.

Powerlink has also entered an input of zero for 2013. Powerlink has not previously calculated this variable or collected data at this finite level. Further, has not yet been able to develop a methodology that would result in an estimate that would meet the AER's RIN review and declaration requirements within the timeframe.

Variable TEF0102 - Average vegetation maintenance span cycle

Powerlink has entered inputs of zero for all years. Powerlink has not previously calculated this variable or collected data at this finite level. Further, Powerlink has not yet been able to develop a methodology that would result in an estimate that would meet the AER's RIN review and declaration requirements within the timeframe.

Variable TEF0103 Average number of trees per vegetation maintenance span

Powerlink has entered an input of zero for 2013. Powerlink has not previously calculated this variable or collected data at this finite level. Further, Powerlink has not yet been able to develop a methodology that would result in an estimate that would meet the AER's RIN review and declaration requirements within the timeframe.

Variable TEF0104 - Average number of defects per vegetation maintenance span

As permitted under the RIN[64], Powerlink has not populated the templates for this variable for years 2009 to 2012, and the cells have therefore been blacked out. Powerlink has not previously calculated this variable and it would be onerous to develop and provide a historical record. Further, Powerlink has not been able to develop a methodology that would result in an estimate that would meet the AER's RIN review and declaration requirements within the timeframe.

Powerlink has also entered an input of zero for 2013. Powerlink has not previously calculated this variable or collected data at this finite level. Further, Powerlink has not yet been able to develop a methodology that would result in an estimate that would meet the AER's RIN review and declaration requirements within the timeframe.

[63] Australian Energy Regulator (2013a). pp. 6-7.
[64] Australian Energy Regulator (2013a). pp. 6-7.

Variable TEF0105 - Tropical proportion

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.1 has been populated with actual data for 2013 and estimated data for 2009 to 2012.

Source

The data has been sourced from the Australian Bureau of Meteorology Australian Climatic Zones map.

Methodology and assumptions

Powerlink's transmission network was overlayed geospatially onto the Australian Bureau of Meteorology Climatic Zones Map, based on temperature and humidity. This allowed Powerlink to develop a count of spans that fall within the Hot Humid Summer and Warm Humid Summer regions, consistent with the instructions for Tropical Spans in the Benchmarking RIN Instructions and Definitions[65].

Why an estimate is required: 2009 - 2013

Estimates are provided for 2009 to 2013 as Powerlink does not hold historical network mapping information in the form required by the AER.

How the estimate has been produced: 2009 – 2013

The data has been derived by estimating applicable built section spans from commissioning dates (from SAP). This was overlaid with the Australian Bureau of Meteorology Australian Climatic Zones map.

Built section spans were filtered by cross referencing with their commissioning date (from SAP). Spans decommissioned before 2013 were estimated using data from the geospatial information system.

Variable TEF0106 - Standard vehicle access

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.1 has been populated with estimated data.

Source

The data is sourced from Powerlink's geospatial information system.

[65] Australian Energy Regulator (2013a). p.32.

Why an estimate is required

Powerlink's systems apply a standard of access to most transmission line structures by 4WD in dry weather. Therefore, no internal data is available on accessibility to assets by 2WD vehicles.

How the estimate has been produced

Estimates for all years have been derived by estimating built section spans from commissioning dates and overlaid with road information from Powerlink's geospatial information system.

Methodology and assumptions

Powerlink applied the following methodology:

- Powerlink's approach was underpinned by Queensland road network data from the Queensland Department of Environment and Resource Management (DERM), which was publicly available[66].
- Using its geospatial information system, Powerlink determined what parts of the road network could be considered 2WD accessible, based on whether it was classified as a highway, motorway, main road, secondary road or named local road.
- It was then necessary to determine proximity from these roads to the infrastructure. Spans that were more than 100 metres from the roads identified above were considered not accessible (i.e. not in a reasonable walking distance or for carrying equipment, etc).
- For years prior to 2013, geospatial data is not available as Powerlink's information system is a live system and does not retain historical data. The same approach above was used to estimate values prior to 2013. However, built spans were filtered out by cross referencing with their respective commissioning dates (from SAP).

Variable TEF0107 - Altitude

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.1 has been populated with actual data for 2013 and estimated data for 2009 to 2012.

Source

Data has been sourced from Geoscience Australia and Powerlink's geospatial information system.

[66] DERM, QLD_RD_Polyline v.6.1.3.

Methodology and assumptions: 2013

Powerlink applied the following methodology:

- Geoscience Australia produces a robust 1 second Digital Elevation Map (DEM)[67]. It records elevation in areas (or cells) of 30 m2. Powerlink considers that a more appropriate estimate can be obtained by dividing each 30 m2 cell further into 10 m2 cells (i.e. there are nine 10m2 cells in each 30 m2 cell).
- Powerlink developed an approach to effectively interpolate between adjacent 30m2 cells, providing altitude estimates for each of the 10 m2 areas within each of the DEM's 30 m2 cells.
- The contour of an area is relevant to planning the location of network infrastructure. Therefore, Powerlink developed appropriate contour representations, consistent with the RIN definition of Altitude[68].
- The contour map was also cross-checked against a 10 metre contour map produced by DERM, which showed that Powerlink's map was fit-for-purpose.
- Using data from Powerlink's geospatial information system, Powerlink's transmission network was overlaid to all cells with terrain contours of 600 metres or greater. The result is the combined length of spans across these cells.

Why an estimate is required: 2009 – 2012

Estimates are required for years 2009 to 2012 as Powerlink’s historical network mapping does not contain information in the form required by the AER.

How the estimate has been produced: 2009 – 2012

Powerlink estimated built section spans for each year using commissioning dates from SAP. These were then overlaid with geospatial information.

For years prior to 2013, built section spans were filtered out by cross referencing with their commissioning date (from SAP). This does not take account of any spans decommissioned before 2013, as they are no longer represented in the geospatial information system.

Variable TEF0108 - Bushfire Risk

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions. The data was based on Powerlink’s bushfire hazard mapping (acquired in 2014) and shows maintenance spans in high bushfire hazard areas.

For this variable, table 8.1 has been populated with actual data.

As permitted under the RIN[69], Powerlink has not populated years 2009 to 2012 as no reasonable data is available, and the cells have therefore been blacked out.

Source

The bushfire risk surrounding the transmission line corridor was sourced from the Queensland State Planning Policy requirements (2014). As such, only 2013 data has been

[67] http://www.ga.gov.au/topographic-mapping/digital-elevation-data.html
[68] Australian Energy Regulator (2013a). p.38.
[69] Australian Energy Regulator (2013a). pp.6-7.

provided. The bushfire hazard mapping was sourced from the Department of Community Safety (DCS) (January 2014).

<u>Methodology and assumptions</u>

Powerlink applied the following approach:

- The number of maintenance spans in high fire bushfire risk areas was identified from a count of spans which directly interact with DCS's Potential Bushfire Risk dataset.
- Each span was filtered by the highest fire risk and then subsequently filtered until all spans directly interacted with their highest potential fire risk category.
- The identified maintenance spans are those from TEF0101 for each regulatory year.

Table: 8.2 Network characteristics

Variable TEF0201 - Route line length

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.2 has been populated with actual data.

Source

This data has been sourced from the Statistical Summary section of Powerlink's Annual Report 2012/2013 for years 2009-2013 and Powerlink's Annual Report 2008/2009 for years 2006-2008.

Methodology and assumptions

The Statistical Summary section of Powerlink's Annual Report is populated with data extracted from Powerlink's enterprise resource planning database, SAP. The extraction is based on a list of regulated built sections[70]. The variable has been calculated as the sum of route kilometres across all voltage levels.

Variable TEF0202 - Variability of dispatch

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.2 has been populated with actual data.

Source

This data has been sourced from Powerlink's Transmission Annual Planning Reports.

Methodology and assumptions

The total sum of non-thermal generation capacity was divided by the total sum of all generation capacity.

[70] Powerlink uses "built sections" as the basic building block against which transmission line circuit and easement information is recorded. A "built section" is defined as a collection of structures, conductors and easements with common characteristics as listed in SAP.

Variable TEF0203 - Concentrated load distance

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.2 has been populated with actual data.

Source

Data for route line length has been obtained from the same source as variable TEF0201 – Route Line Length. Data on sizes of generation and load has been obtained from Powerlink's Transmission Annual Planning Report 2013 (TAPR 2013).

Generation and load connection points were taken from variables TOPCP0101 – TOPCP0104 (Number of entry points at each transmission voltage level) and TOPCP0201 – TOPCP0208 (Number of exit points at each transmission voltage level) respectively.

Methodology and assumptions

This variable is defined as the:

> Greatest distance (Route Line Length) from node having at least 30 per cent of generation capacity to node having at least 30 per cent of load, where a node is a connection point from a generation source or location to the (transmission) network at source end and a connection point to a load or distribution system at the destination end.
>
> Where there is no concentrated source or load above 30 per cent, respond relative to the largest concentrated source and load and indicate the generation and load magnitudes.[71]

From the generation capacities in Table 6.1 of TAPR 2013, there is no concentrated generation source greater than 30% of the total. The largest concentrated source is Stanwell Power Station, as the Gladstone Power Station capacity is distributed across two different connection points. Stanwell Power Station capacity is 1460 MW, 12.9% of summer 2013/14 installed capacity.

From Table A.1 of Appendix A of TAPR 2013, there is no concentrated load greater than 30% of the total. The largest concentrated load is South Pine 110kV. The Boyne Island aluminium smelter load, while slightly larger in total, is distributed across two different connection points. South Pine forecast demand coincident with Queensland state peak demand for 2013/14 is 847.5 MW, 10.5% of summer 2013/14 forecast state peak native demand of 8043 MW.

Having established the source and load nodes, the shortest transmission line circuit length between the two points was identified as Stanwell – Calvale – Halys – Tarong – South Pine.

[71] Australian Energy Regulator (2013a). p.38.

Variable TEF0204 Total number of spans

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Benchmarking RIN Instructions and Definitions.

For this variable, table 8.2 has been populated with actual data for 2013 and estimated data for 2006-12.

Source

Powerlink's corporate enterprise resource planning database, SAP.

Methodology and assumptions: 2013

The RIN template has been populated with data extracted from SAP. The extraction is based on a list of regulated active ground spans.

Why an estimate is required

Accurate decommissioning dates are not available for individual spans before 2013 as this data was not required for operation of the transmission network.

How the estimate has been produced: 2006-12

The RIN template has been populated with data derived from SAP. The extraction is based on a list of regulated active ground spans for each year filtered by commissioning date. This does not take account of any spans decommissioned before 2013, as no span decommissioning data has been recorded.

Table: 8.3 Weather stations

Variable TEF03 - Weather stations

RIN requirements

This section has been completed in accordance with chapter 8, section 8.1 of the Economic Benchmarking RIN Instructions and Definitions.

For this variable, table 8.3 has been populated with actual data.

Source

A list of weather stations used by Powerlink to calculate line ratings is available in Powerlink's ratings database (TNDB). A list of Queensland Bureau of Meteorology (BOM) weather stations within Powerlink's network was obtained from Powerlink's spatial data system.

Methodology and assumptions

A list of all weather stations in Powerlink's network was determined by locating all BOM weather stations within a 50km radius from Powerlink transmission lines.

All other weather stations have been listed as no materiality.

References

Australian Energy Market Commission, National Electricity Rules, Version 60, January 2014.

Australian Energy Market Operator (2013). List of Regional Boundaries and Marginal Loss Factors for the 2013-14 Financial Year.

Australian Energy Regulator (2012). Final Decision – Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme, December.

Australian Energy Regulator (2013a). Economic Benchmarking RIN for Transmission Network Service Providers, Instructions and Definitions, Queensland Electricity Transmission Corporation Limited.

Australian Energy Regulator (2013b). Better Regulation Explanatory Statement, Regulatory Information Notices to Collect Information for Economic Benchmarking, November.

Bureau of Meteorology: www.bom.gov.au.

Department of Environment and Resource Management. QLD_RD_Polyline v.6.1.3.

Emails from the AER:

- AER Scenario Reference Guide, 13 December 2013.
- EBT RIN – interconnectors and connection point numbers, 12 February 2014.
- Economic Benchmarking RIN STPIS Variables, 6 December 2013.
- Staff Issues Log – Draft Category Analysis RIN, 14 February 2014.

Geoscience Australia. Digital Elevation Data: http://www.ga.gov.au/topographic-mapping/digital-elevation-data.html

Powerlink, Annual Planning Report 2013.

Powerlink, Financial Statements 2012/13.

Powerlink, Cost Allocation Methodology, V2, AER approved, 15 August 2008.