

Appendix 4D:

Unit Rates

TRR 2014/15 – 2016/17 P50 Unit Rates – Primary, Civil, Secondary and Lines

PUBLIC VERSION

TRR P50 Unit Rates – Primary, Civil, Secondary and Lines

ISSUE/AMENDMENT STATUS

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TRR P50 Unit Rates – Primary, Civil, Secondary and Lines

1 General

The P50¹ unit rates have been prepared to assist with the development of planning and program cost estimates for the Transmission Revenue Reset submission. These rates have been extracted from the SP AusNet top-down estimating model based on typical bay and component costs, adopting relevant assumptions.

The P50 unit rates have been prepared primarily for estimating at a high level and do not replace the standard estimating process used during project development, i.e. these rates do not replace estimates prepared in accordance with SP AusNet Specifications and Standards.

2 Objectives

The objective is to prepare a set of P50 unit rates that are fully consistent with the P50 rates for identical items developed through the standard estimating process. These rates may then be applied to the evaluation of prospective projects and programs of work.

2.1 Scope and Estimate Assumptions

The following assumptions have been adopted in the preparation of the unit rates:

- a) Unit rates developed are for indicative estimation purposes only (not for project development),
- b) All primary, civil and secondary unit rates are based on works at a metropolitan terminal station and assume that the scale of works involve:
 - a. Four similar bays of equipment as a single project.
 - b. 220kV & 66kV circuit breakers replace bulk oil circuit breakers.
 - c. Four similar protection and control schemes are replaced as a single project except bus protection where two bus protection schemes are replaced as a single project.
 - d. One switchyard rack structure, transformer or reactive plant is replaced as a single project.
- c) The rates allow for new footings and structures where applicable,
- d) An allowance has been made for outages,
- e) Costs are based on 2011/12 dollars,
- f) Lines costs based on the following;
 - a. 330kV tower replacement – Remove an existing tower. Supply, install & commission a new tower also includes traffic management, 50 metre access track and crane pad.
 - b. Groundwire 'Like for Like' – 10km replacement in metro area, 4 pulls, 5 spans of cradle blocking and traffic management.
 - c. Groundwire replacement with OPGW – 10km replacement in metro area, 4 pulls, 5 spans of cradle blocking, traffic management and hockey stick installation/tower strengthening of suspension structures.

¹ P50 estimate is an estimate prepared at any stage of a project which has a 50% confidence factor of not being exceeded by cost at completion.

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- d. Phase conductor direct retrofit - 500kV – km rate based on 6km of double circuit, quad conductor stringing, country Victoria, 1 strain tower installation and 6km of ERS type by-pass.
- e. Phase conductor direct retrofit - 220kV – km rate based on double circuit, twin phase conductor stringing, country Victoria 4km of replacement.
- f. Rack fall arrest system includes, earthwire masts, gantry ladders, removing steel, travel and LAHA.
- g. Tower fall arrest, 330kV flat top delta consisting of ladder fall arrest, horizontal system, peak strengthening and walkway installation. 500kV is ladder fall arrest installation and horizontal system.
- g) No allowance has been made for:
 - a. Any planning and building permit applications,
 - b. Site surveys and geotechnical investigations,
 - c. Control building extensions,
 - d. New battery room or battery room refurbishments,
 - e. Civil works associated with extra cable ducts or trenches,
 - f. Secondary systems in primary unit rates,
 - g. Removal of asbestos in buildings,
 - h. Removal of panels with asbestos,
 - i. Communication systems and schemes,
 - j. Management Reserve²,
 - k. Cost Escalations³,
 - l. Interest During Construction (IDC) and company Overheads,
 - m. Written-Down Values, line rebates and MIP Scheme⁴.

² Management Reserve: A provisional amount to cover uncertainty that is outside the control of the project (sometimes called "unknown unknowns"). Management Reserve may involve cost and/or schedule (time) reserve. Management Reserve is to be administered at program level.

³ The anticipated changes in the costs or price of specific goods or services in a given economy over a period. This is similar to the concepts of inflation and deflation except that escalation is specific to an item or class of items (not as general in nature). e.g. Currency exchange rates, Commodity prices

⁴ MIP Scheme: Market Impact Parameter Transmission Incentive Scheme.

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3 References

Project Cost Estimating Methodology TRR 2014/15 – 2016/17

3.1 Unit Rates – Primary Systems

3.1.1 Switchyard Bay Equipment Replacement

3.1.1.1. 500kV

Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Replacement of 500kV 3 Phase CT's	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
2	Replacement of 500kV Live Tank Circuit Breakers	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
3	Replacement of 500kV ROI	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
4	Replacement of 500kV SA's	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
5	Replacement of 500kV CVT's	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]

New

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	New 500kV Bus (3 Phase) 30 Metre Section	Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
2	500kV Rack, Complete new Installation in empty bay only.	Supply & install new complete rack structure with foundation.	[C-I-C]	[C-I-C]
3	500kV Exit Span (120m nominal) Complete new Installation in empty bay only	Supply, install & commission new.	[C-I-C]	[C-I-C]

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3.1.1.2. 220kV**Replacement**

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Replacement of 220kV 3 Phase CT's	Remove existing. Supply, install & commission new on existing structure.	[C-I-C]	[C-I-C]
2	Replacement of 220kV Dead Tank Circuit Breakers	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
3	Replacement of 220kV ROI	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
4	Replacement of 220kV SA's	Remove existing. Supply, install & commission new on existing structure.	[C-I-C]	[C-I-C]
5	Replacement of 220kV CVT's	Remove existing. Supply, install & commission new	[C-I-C]	[C-I-C]

New

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	New 220kV Bus (3 Phase) 12 Metre Section	Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
2	220kV Rack, Complete new Installation in empty bay only.	Supply & install new complete rack structure with foundation.	[C-I-C]	[C-I-C]
3	220kV Exit Span (80m nominal) Complete new Installation in empty bay only	Supply, install & commission new.	[C-I-C]	[C-I-C]

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3.1.1.3. 66kV

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Replacement of 66kV 3 Phase CT's	Remove existing. Supply, install & commission new on existing structure.	[C-I-C]	[C-I-C]
2	Replacement of 66kV Dead Tank Circuit Breakers	Remove existing. Supply, install & commission new complete with foundation.	[C-I-C]	[C-I-C]
3	Replacement of 66kV ROI	Remove existing. Supply, install & commission new on existing structure.	[C-I-C]	[C-I-C]
4	Replacement of 66kV SA's	Remove existing. Supply, install & commission new on existing structure.	[C-I-C]	[C-I-C]
5	Replacement of 66kV MVT's	Remove existing. Supply, install & commission new on existing structure.	[C-I-C]	[C-I-C]
6	66kV Bus (3 Phase) 8 Metre Section Replacement	Remove existing. Supply, install & commission new 3500A on existing structure.	[C-I-C]	[C-I-C]
7	Replacement 66kV Feeder Exit Pole.	Remove existing. Supply, install & commission a new exit pole.	[C-I-C]	[C-I-C]
8	Replacement 66kV Exit Span	Remove existing. Supply, install & commission new 80 meter Triton span.	[C-I-C]	[C-I-C]
9	Replacement of 66kV Cap Bank Circuit Breakers	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
10	Replacement of 66kV Cap Bank	Remove existing. Supply, install & commission new 66kV 25MVAr Capacitor Bank and 60mH Reactors.	[C-I-C]	[C-I-C]

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3.1.2 Major Primary Equipment Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Replacement of 500/220kV 1000MVA Transformer, 4 x 1 Phase Unit (Including Spare Unit)	Remove existing. Supply, install & commission new transformers, based greenfield installation.	[C-I-C]	[C-I-C]
2	Replacement of 500/220kV 600MVA Transformer, 3 Phase Unit	Remove existing. Supply, install & commission new transformer, based greenfield installation.	[C-I-C]	[C-I-C]
3	Replacement of 220/66kV 225MVA Transformer	Remove existing. Supply, install & commission new transformer, based existing footing less fire wall & rack.	[C-I-C]	[C-I-C]
4	Replacement of 220/66kV 150MVA Transformer	Remove existing. Supply, install & commission new transformer, based existing footing less fire wall & rack.	[C-I-C]	[C-I-C]
5	Replacement of 220kV, 50MVA, 250mH, Capacitor Bank.	Remove existing. Supply, install & commission new based greenfield installation.	[C-I-C]	[C-I-C]

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3.2 Unit Rates – Civil Works
3.2.1 Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Replace Security Perimeter Fence	Remove existing & install new Electric Fence based on 800 Metres.	[C-I-C]	[C-I-C]
2	Replace Control Building	Remove existing & install new Control Building based on 600 square metres. Does not include Protection Panels & Asbestos Removal	[C-I-C]	[C-I-C]
3	Re Dress Yard Surface	Remove existing & install New based on 10,000 square metres.	[C-I-C]	[C-I-C]
4	Install Diesel Generator (350kVA)	Remove existing. Supply, install & commission new	[C-I-C]	[C-I-C]
5	Oil Treatment Plant (to suit 150MVA Transformer)	Remove existing & install New.	[C-I-C]	[C-I-C]
6	Replace fire hydrant system (per Metro station)	Remove existing & install New.	[C-I-C]	[C-I-C]

3.2.2 New

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Cable Trenching	Install new based on 100 metres Including road crossing & Pits.	[C-I-C]	[C-I-C]
2	Station Road (Sealed)	Install new based on 100 metres.	[C-I-C]	[C-I-C]
3	Earth Grid	Install new based on 10,000 square metres.	[C-I-C]	[C-I-C]
4	Rural Fire System	Supply & Install new Rural Fire System.	[C-I-C]	[C-I-C]
5	Add Fire Hydrant to Existing System	Add fire hydrant to existing system.	[C-I-C]	[C-I-C]

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3.3 Unit Rates – Secondary Systems
3.3.1 Protection and Control Equipment
3.3.1.1. 500kV

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	500kV Line X & Y Protection - Standard System including Over Voltage (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
2	500kV Line X Protection - Standard System including Over Voltage (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
3	500kV Line Y Protection - Standard System (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
4	500kV Single CB Management (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
5	500kV Bus X & Y Protection (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
6	500kV Transformer X & Y Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
7	500kV Transformer X Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
8	500kV Transformer Y Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]

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3.3.1.2. 220kV

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	220kV Line X & Y Protection - Current Diff Only (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
2	220kV Line X Protection (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
3	Replace Y Protection on 220kV Line (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
4	220kV Single CB Management (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
5	220kV Bus X & Y Protection (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
6	220kV Transformer X & Y Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
7	220kV Transformer X Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
8	220kV Transformer Y Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]

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3.3.1.3. 66kV**Replacement**

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	66kV X&Y Differential Feeder Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
2	66kV X&Y Bus Protection Scheme Replacement	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
3	66kV Bus Tie Protection & Control (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
4	66kV Anti-Islanding Scheme	Supply, install & commission new.	[C-I-C]	[C-I-C]
5	66kV Load Shed Scheme	Supply, install & commission new.	[C-I-C]	[C-I-C]
6	66kV Auto-Close Scheme (Std Four Bus)	Supply, install & commission new.	[C-I-C]	[C-I-C]

New installation

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	66kV Anti-Islanding Scheme	Supply, install & commission new.	[C-I-C]	[C-I-C]
2	66kV Load Shed Scheme	Supply, install & commission new.	[C-I-C]	[C-I-C]
3	66kV Auto-Close Scheme (Std Four Bus)	Supply, install & commission new.	[C-I-C]	[C-I-C]

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3.3.2 Miscellaneous Protection and Control Equipment**3.3.2.1. Replacement**

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	SCIMS System - One rack cabinet complete installed not including IO (Add to existing)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
2	SCIMS System - Two rack cabinet complete installed not including IO	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
3	SCIMS System - Three rack cabinet complete installed not including IO	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
4	48V Battery Bank, Chargers & Dist Board (X & Y) - 300Ah (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]
5	250V Battery Bank, Chargers & Dist Board (X & Y) - 300Ah (Replacement)	Remove existing. Supply, install & commission new.	[C-I-C]	[C-I-C]

3.3.2.2. New Installation

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	ITC Internal, 2 strip - Installed complete w/o cabling	Supply & install new panel only.	[C-I-C]	[C-I-C]
2	External ITC, 2300 x 3000 x 300, 6 Strip, Installed including Cabling to Internal ITC	Supply & install new panel including cabling to internal ITC.	[C-I-C]	[C-I-C]
3	Electronic Security (Standard System plus 7 Cameras)	Supply, install & commission new	[C-I-C]	[C-I-C]

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3.4 Unit Rates - Lines

3.4.1 Tower Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	330kV suspension tower replacement with new 330kV strain tower	Remove existing tower. Supply, install & commission new tower also includes traffic management, 50 metre access track and crane pad.	[C-I-C]	[C-I-C]

3.4.2 Insulator Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	500kV strain insulator replacement with new 500kV composite strain insulator	Supply, install & commission new quad insulator per tower for 1 circuit.	[C-I-C]	[C-I-C]
2	500kV suspension insulator replacement with new 500kV composite suspension insulator	Supply, install & commission new quad insulator per tower for 1 circuit.	[C-I-C]	[C-I-C]
3	220kV strain insulator replacement with new 500kV composite strain insulator	Supply, install & commission new twin insulator per tower for 1 circuit.	[C-I-C]	[C-I-C]
4	220kV suspension insulator replacement with new 500kV composite suspension insulator	Supply, install & commission new twin insulator per tower for 1 circuit.	[C-I-C]	[C-I-C]

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3.4.3 Ground-wire Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Direct retrofit of existing ground-wire with like for like replacement metropolitan area	Remove existing. Supply, install & commission new, per km rate	[C-I-C]	[C-I-C]
2	Direct retrofit of existing ground-wire with OPGW	Remove existing. Supply, install & commission new, per km rate	[C-I-C]	[C-I-C]
3	Critical crossing single span ground-wire replacement like for like	Remove existing. Supply, install & commission new, includes cradle block cost (per span rate)	[C-I-C]	[C-I-C]

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3.4.4 Phase Conductor Replacement

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Direct retrofit of existing 500kV Quad phase conductor – double circuit	Remove existing. Supply, install & commission new, per km rate (includes ERS by-pass)	[C-I-C]	[C-I-C]
2	Direct retrofit of existing 220kV twin phase conductor – double circuit	Remove existing. Supply, install & commission new, per km rate	[C-I-C]	[C-I-C]
3	Critical crossing single span, single phase-wire replacement like for like	Remove existing. Supply, install & commission new, includes cradle block cost (per span rate)	[C-I-C]	[C-I-C]

3.4.5 Fall Arrest

Item	Project Name	Scope of Work Summary	Cost (In 2011 Dollars)	Approx. Time to Complete (Months)
1	Rack System Fall Arrest	Supply & install new fall arrest per terminal station site	[C-I-C]	[C-I-C]
2	330 kV Tower System Fall Arrest	Supply & install new fall arrest on single flat top delta type tower	[C-I-C]	[C-I-C]
3	500 kV Tower System Fall Arrest	Supply & install new fall arrest on single flat top delta type tower	[C-I-C]	[C-I-C]