AusNet Electricity Services Pty Ltd

Electricity Distribution Price Review 2016–20

Appendix 7C: Unit Rates (Public Version)

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Unit Rates

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1 Introduction

The purpose of this document is to provide the unit rates that been applied to forecast capital expenditure for the 2016-2020 EDPR and to explain the basis of each of the rates.

All rates are P50 and are presented in $2014/15[1]. A 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.

2 Basis of Rates

The basis of the unit rates used to develop the capital expenditure forecast is described in this section.

2.1 Methodology

2.1.1 Lines & Enhanced Safety Programs

The unit rates used to forecast costs of most lines related works, including the majority of the safety related expenditure, are based on the historical rates. These rates are calculated by summing the direct costs incurred for each category of asset replacement over the 12 month period from November 2013 to October 2014[2] and dividing this by the volume of replacement activities.

Where a unit rate has not been developed on this basis, the alternative methodology is noted in the rates tables shown in Section 3.

All rates are the direct cost of undertaking the activity and do not include overheads or finance charges.

2.1.2 Substations

The approach to forecasting capital expenditure categories is explained in the *Project Cost Estimating Methodology*. This document details the unit rates used in each category of capital expenditure.

The unit rates are compiled based on the project cost estimating spreadsheet (Top-down distribution estimate for option selection only). This spreadsheet is built up using a bottom up approach, with labour and materials itemised individually. The spreadsheet is maintained by Project Development Team.

The following have been adopted in the preparation of the unit rates for works within the substation:

- Material costs are based on period contract pricing from suppliers as of April 2014
- Design Service Provider (DSP) panel rates have been used to estimate design costs
- Installation Service Provider (ISP) services agreement rates for labour and plant rates have been used to estimate construction costs
- AusNet Services internal cost i.e. Project Management, Quality Assurance, Site Supervision and Engineering support rates are based on DSP panel rates
- Project Components Uncertainty[3] (value applied to reference estimate to arrive at P50 outcome)

Further explanation of the project cost estimating database and methodology is contained in the *Project Cost Estimating Methodology.*

[1] 2014/15 is the AusNet Service financial year commencing 1 April 2014 and ending 31 March 2015

[2] This period was chosen as it was the most recent 12 month period for which unit rates were available.

[3] Project Components Uncertainty is a calculation (or estimate) of the variability that occurs in all projects. This variability arises from uncertainty in pricing or volumes of component activities. The uncertainties are a portion of the difference between the outturn and assumptions in the reference estimate.

All rates are the direct cost of undertaking the activity and do not include overheads or finance charges.

3 Unit Rates

3.1 Lines

The rates in this section have been used to estimate programs of expenditure associated with replacement of lines assets.

3.1.1 Assumptions

Lines asset replacement works are delivered by a combination of internal and external resources depending upon the region and work delivery volumes. The unit rates are the average across the network and are not reflective of highest or lowest rates.

3.1.2 Limitations

Financial information is not captured at the works specification level. This limits the ability to calculate a historic unit rate specific to some of the asset categories.

- It was not possible to split the historic rates between the 3 different pole types, Wood, Concrete or Steel.
- Distribution substation replacement costs have been calculated as an average across all types. The cost of replacing a distribution substation varies greatly. A 25 kVA pole type transformer is an order of magnitude less expensive than a 500 kVA kiosk. A change in the mix of substations replaced could result in a materially different replacement cost.

3.1.3 Contractor overheads

A delivery partner is engaged to deliver a significant proportion of lines related capital work in one of the three delivery regions. The contract with this supplier specifies that AusNet Services will pay a component of the supplier's overhead. The overhead is not included in the unit rates paid to the contractor and is not incorporated into the historical direct costs used to develop the unit rates.

The rates shown in the Table 1 do not incorporate contractor overheads. The overheads have been incorporated into the total costs in the Capex model.

3.1.4 Rates

Table 1- Lines Unit Rates

Category	Description	Rate	Basis and Unit of Measure
Poles - Sub transmission (66 kV)	Complex Structure HV/LV structures including Substation Poles, Switch Poles, Cable Head Poles, Regulator & ACR Poles – Open Wire and ABC conductor	[C.I.C]	Per pole Includes pole top hardware
	Simple Structure Single Circuit Intermediate or angle structure - Open Wire and ABC conductor	[C.I.C]	Per Pole Includes pole top hardware
Poles Distribution (22/11/6.6 kV)	Complex Structure HV/LV structures including Substation Poles,	[C.I.C]	Per Pole Includes pole top

EDPR Unit Rates

Category	Description	Rate	Basis and Unit of Measure
	Switch Poles, Cable Head Poles, Regulator & ACR Poles – Open Wire and ABC conductor		hardware
	Simple Structure HV/LV Structures – Intermediate/Angles, Strains, Terminations, and Small Substation Poles (Single Phase & SWER Distribution) – Open Wire and ABC conductor	[C.I.C]	Per Pole Includes pole top hardware
	Low Voltage (<1 kV) Intermediate, Strain, Termination, Anchor, Tee-off – LV Open Wire or LVABC	[C.I.C]	Per Pole Includes pole top hardware
	Aerial Guy Pole/Public Lighting Pole/Column/Service Pole	[C.I.C]	Per Pole
Pole – Staking or Reinforcement	Installation of RFD Pole Stakes to reinstate an Unserviceable or Limited Life pole – Sub-transmission, HV and LV poles Re-butting of an Unserviceable or Limited Life pole – Sub-transmission, HV and LV poles	[C.I.C]	Per Pole
Crossarms	Sub transmission (66 kV) Intermediate, Strain, Termination, Anchor	[C.I.C]	Per Crossarm Includes associated hardware
	High Voltage (22/11/6.6 kV) Intermediate, Strain, Termination, Anchor, Angle, Tee-off, Dressing-Down Crossarm	[C.I.C]	Per Crossarm Includes associated hardware
	Low Voltage (<1 kV)	[C.I.C]	Per Crossarm Includes associated hardware
Conductor[4]	Span of Defective Conductor (1 Phase or 3 Phase) Replacement of HVABC Conductor (Per Span > 3 Metres In Length) Replacement of LVABC Conductor - Per Span	[C.I.C]	Per span
Distribution Substation Transformers	Replace Defective or Faulted Transformer on Pole Type Substation, or Ground Type Substation	[C.I.C]	Per Substation
Switches and ACR (Auto Circuit Recloser)	High Voltage	[C.I.C]	Per Switch
Low Voltage Services	Overhead Service Line From Pole to Installation	[C.I.C]	Per Service Average of proactive (planned) and reactive (replace on failure)
Surge Arresters	Line Class	[C.I.C]	Per Surge Arrester
Voltage Regulators	All	[C.I.C]	Per Regulator (3 phases)

[4] For programmed conductor replacement, refer to section 3.4.2.

3.2 Stations

The rates in this section have been used to estimate programs of expenditure associated with replacement of stations assets. These assets are located within the zone substations used to transform sub-transmission voltages to distribution voltages. Rates in this section are inclusive of civil, primary equipment and associated secondary works, unless otherwise specified.

3.2.1 Allowances

The following items have been allowed for within the stations unit rates:

- Decommissioning and removal of existing equipment
- Supply, installation, testing and commissioning of equipment
- Earthworks, foundations and structures (where applicable)
- Cabling (secondary and power) (where applicable)
- Protection and control associated with the equipment including interfacing works (where applicable)
- Interplant connections
- Earthing modifications
- Operational outage costs (i.e. planning preparation of outages & network switching)
- Design
- AusNet Services internal labour costs (i.e. Project Management, Quality Assurance, Site Supervision and Engineering support)
- Contractor indirect costs.

3.2.2 Exclusions

The following items have been excluded from the stations unit rates:

- Planning and building permit applications
- Land acquisitions and easement creation
- Site surveys, geotechnical investigations and reports
- Additional cable ducts or cable trenches - assume existing is suitable and sufficient capacity
- Removal of contaminants such as asbestos, PCBs and contaminated soil
- Costs associated with any environmental works
- Communication systems and schemes
- Management reserve[5]
- Cost escalations
- Financing cost and corporate overheads
- Written-down values
- Spares
- Operations and maintenance costs.

[5] An amount of funds, budget, or time needed above the estimate to cover the costs of unforeseen factors related to the delivery of the project objectives, which are not provided for elsewhere in the total job costs. Management Reserve is to be administered at program level. These can include but are not limited to the occurrence of an unplanned or unforeseen event such as a natural event or a major safety incident and the change to planned assumptions, stakeholder issues (outage restrictions, community) and delayed access to site, industrial relations issues external to the Project / Program, and contractual issues or claims.
Management Reserve is the difference between P(90) (An estimate prepared at any stage of a project which has a 90% confidence factor of not being exceeded by cost at completion) and P(50) outcomes.

3.2.3 Primary Rates

Table 2 provides the unit rates for 22 kV stations primary equipment.

Table 2 – 22 kV Primary Equipment Unit Rates

Unit	Rate	Basis
Capacitor Bank – 6 MVAr with 7% (19.3 mH) current limiting series reactor	[C.I.C]	• Includes: ○ Power cable and conduit (30m) ○ New capacitor bank protection scheme and integration ○ Safety fencing
Capacitor Bank Can – 603 kVAr	[C.I.C]	
Reactor (For Capacitor Bank) - 7% (19.3 mH) current limiting series reactor	[C.I.C]	
Circuit Breaker: Dead Tank – Outdoor, 22 kV 2000A 31.5kA, 4 5 A bushing current transformer cores per phase: 0.2PX160, R0.55 on 1600/5	[C.I.C]	• Includes: ○ Duplicated secondary cabling to Interface Termination Cubicle (ITC)
Neutral Earthing Resistor – 22/12.7 kV, 1600 A/10sec, Outdoor, single phase 8 ohm neutral earthing resistor with bypass Circuit Breaker and series Current Transformers and Voltage Transformers	[C.I.C]	• Includes: ○ Neutral Current Transformers and isolator ○ New earth fault back up protection scheme and integration ○ Provision for SCADA RTU modifications ○ Provision for Digital Interface Cubicle modifications ○ Duplicated secondary cabling to ITC ○ Monitoring accessories ○ Power cable and conduit (40m)
Neutral Earthing Compensator	[C.I.C]	• Includes: ○ Power cabling (30m) ○ Termination frame ○ NEC protection and control scheme
Isolator: Underslung – 1600 A, 31.5 kA	[C.I.C]	• 3 phase, Hook stick operated • Includes: ○ 8.9kN station post insulators ○ Earthing receptacles (two sets)
Isolator: Rotary Double Break – 1600 A, 31.5 kA	[C.I.C]	• 3 phase, ganged manual operation • Includes: ○ Manually operated earth switch ○ Earthing receptacles (one set)
Current Transformer – 2000 A, 31.5 kA	[C.I.C]	• 3 phase set • Includes:

Unit	Rate	Basis
		○ Marshalling box and secondary cabling to ITC
Voltage Transformer – 24 mS, 0.5M/1P	[C.I.C]	• 3 phase set • Includes: ○ Marshalling box and secondary cabling to ITC
Surge Arrester – 31.5 kA short circuit withstand current, 10 kA peak nominal discharge current	[C.I.C]	• 3 phase set
Modular Switchroom – Including switchgear	[C.I.C]	• Approx. 4.5m x 12.5m steel framed building • Excludes: ○ Demolition of existing switchroom ○ 22kV power cabling ○ DC supply and batteries • Building includes: ○ Air conditioning system ○ Fire detection system ○ Control room complete with ITC • Protection panels included: ○ Four (4) 22kV feeder protection ○ Two (2) Capacitor bank protection ○ X & Y Bus protection ○ CB failure protection ○ Bus Tie protection • Switchgear includes: ○ One (1) 2000A, 20kA transformer panel including 5, 5 A current transformer cores ○ Four (4) 1250A, 20 kA feeder panels including 2, 5A current transformer cores ○ Two (2) 1250A, 20 kA capacitor panels including 2, 5A current transformer cores ○ One (1) 2000A, 20 kA bus tie panel including 5, 5A current transformer cores ○ Single bus with a 50 VA voltage transformer 0.5M/1P

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Table 3 provides the unit rates for 66 kV stations primary equipment.

Table 3 - 66 kV Primary Equipment Unit Rates

Unit	Rate	Basis

Power Transformer – Yyn0(d11), 66/22kV, 15/20 MVA with 4hr 30 MVA emergency rating, 10% nominal impedance, tapping range -26% to +5 %	[C.I.C]	• Reuse footings and firewall
		• Excludes protection upgrades
		• Includes:
		  ○ Removal of existing transformer
		  ○ Neutral isolator, neutral current transformers and associated isolation structure
		  ○ 66kV surge arresters
		  ○ Secondary cabling to ITC

Circuit Breaker: Dead Tank – 3150A, 40kA, 4 5A bushing current transformer cores per phase: 0.1PX1000, R1.6 on 3000/5	[C.I.C]	• Includes:
		  ○ Duplicated protection and control schemes, integrated into existing station
		  ○ Secondary cabling to ITC

Isolator: Underslung – 2000A, 31.5kA	[C.I.C]	• 3 phase, Hook stick operated
		• Includes:
		  ○ 12.5kN station post insulators
		  ○ Earthing receptacles (two sets)

Isolator: Rotary Double Break – 800A, 25kA	[C.I.C]	• 3 phase, ganged manual operation
		• Includes:
		  ○ Manually operated earth switch
		  ○ Earthing receptacles (one set)

Current Transformer – 2000A, 31.5kA, 5 5A cores per phase, 0.14PX700, R1.1 on 2100/5	[C.I.C]	• 3 phase set • Includes: ○ Marshalling box and secondary cabling to ITC
Voltage Transformer - 24mS, 0.5M/1P	[C.I.C]	• 3 phase set • Includes: ○ Marshalling box and secondary cabling to ITC
Surge Arresters – 31.5kA short circuit withstand current, 10kA peak nominal discharge current	[C.I.C]	• 3 phase set

Bus section – 100mm OD, 6mm WT welded aluminium tube, 2500A rating.	[C.I.C]	• Includes:
		  ○ 8 metre section of 3 phase rigid bus
		  ○ 12.5kN station post insulators
		  ○ Support structure and associated footings.

3.3 Secondary

The rates in this section have been used to estimate programs of expenditure associated with secondary assets. These assets are located within zone substations and include items such as line protection, transformer protection and capacitor bank protection.

3.3.1 Allowances

The following items have been allowed for in the secondary unit rates:

- Decommissioning and removal of existing equipment
- Supply, installation, testing and commissioning
- Control cabling from cubicle to ITC
- Intercubicle wiring
- Cubicle earthing and cable tray
- Modification and interfacing works
- Design
- AusNet Services internal labour costs (i.e. Project Management, Quality Assurance, Site Supervision and Engineering support)
- Contractor indirect costs

3.3.2 Exclusions

The following items have been excluded from the secondary unit rates:

- Building modification works
- Removal of asbestos
- Communication systems and schemes
- Non-standard / site specific installations
- Management reserve
- Cost escalations
- Financing costs and corporate overheads
- Written-down values
- Operation and maintenance costs
- Spares.

3.3.3 Secondary Rates

Table 4 provides the unit rates for stations secondary equipment.

Table 4 - Secondary Equipment Unit Rates

Unit	Rate	Basis
66kV Line Protection	[C.I.C]	• X & Y modular scheme includes o Current differential protection o Back up distance protection o Auto reclose o Circuit breaker failure o Circuit breaker management o Circuit breaker control o Line instrumentation quantities

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Unit	Rate	Basis

66kV Autoclose	[C.I.C]	• Four (4) bus arrangement
		• Tap matching scheme
		• Autoclose panel includes:
		  ○ Autoclose relay
		  ○ Interface/tap matching relay

22kV Feeder Protection	[C.I.C]	• Modular scheme includes
		  ○ Two (2) feeders on panel
		  ○ Overload protection
		  ○ Sensitive earth fault protection
		  ○ Auto reclose
		  ○ Circuit breaker management
		  ○ Circuit breaker control
		  ○ Feeder instrumentation quantities

66/22 kV Transformer Protection	[C.I.C]	• X & Y modular scheme includes
		  ○ Differential Protection
		  ○ Overload
		  ○ Circuit breaker failure
		  ○ 66 kV circuit breaker management
		  ○ 66 kV circuit breaker control
		  ○ Transformer instrumentation quantities

22 kV Bus Protection	[C.I.C]	• X & Y modular scheme includes
		  ○ Differential protection
		  ○ Bus Overload
		  ○ 22 kV Transformer and bus tie:
		  ▪ Circuit breaker failure
		  ▪ Circuit breaker management
		  ▪ Circuit breaker control

22 kV Earth Fault Backup Protection	[C.I.C]	• Earth Fault Backup Protection

22 kV Cap Bank Protection	[C.I.C]	• X & Y modular scheme
		  ○ Overload protection
		  ○ Circuit breaker management
		  ○ Circuit breaker control
		  ○ Instrumentation quantities

Zone Substation RTU	[C.I.C]	• SCIMS System – Large (3 rack RTU)
		• Includes:
		  ○ SCIMS Panel
		  ○ HMI
		  ○ GPS clock
		  ○ DSP Mapping & Design
		  ○ Testing
		  ○ NOC Review & Display Implementation

3.4 Enhanced Safety Programs

The rates in this section have been used to estimate programs of expenditure associated with the Enhanced Safety Program.

3.4.1 Assumptions

Safety program works are delivered by a combination of internal and external resources depending upon the region, the program and work delivery volumes. The unit rates selected are the average across the network and are not reflective of highest or lowest rates.

3.4.2 Rates

Table 5 provides unit rates for enhanced safety program activities.

Table 5 - Enhanced Safety Programs Unit Rates

Category	Description	Rate	Unit of Measure	Basis of Rates
Installation of Armour Rods and Vibration Dampers	Install or replace armour rods and vibration damper on the following structures • SWER Intermediate • SWER Angle • Intermediate Single Phase • Intermediate Three Phase • Angle Single Phase • Angle Three Phase	[C.I.C]	Per Structure	• Based on the historical average rate and mix of activities.
Conductor Replacement	Proactive program to replace conductor: - Steel - Copper	[C.I.C]	Per km	• Average unit rate based on historic average cost
EDO Fuse Unit Replacement	Replacement of EDO to Boric Acid unit on the following structures • SWER • Single Phase • Three Phase	[C.I.C]	Per Unit	• Based on reported volumes and costs in annual RINs 2011 to 2013
Animal Proofing	Animal Proofing of the following • The retrofitting of an existing concrete pole substation structure with Animal Proofing materials • The retrofitting of an existing complex (termination, strain, anchor) High Voltage or wood pole substation structure with Animal Proofing material • The retrofitting of an existing pole or ground type substation or Cable Head Pole structure with minor	[C.I.C]	Per Structure	• Average rate based on a mix of structure types and both full and minor animal proofing.

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Category	Description	Rate	Unit of Measure	Basis of Rates
	Animal Proofing materials.			
Overhang Removals	Replacement of bare overhead wire classified as a 56M with High Voltage Aerial Bundled Cable	[C.I.C]	Per 56M span	• Based on historical rate of undertaking similar activity.
Line Clearance	Rectification of Line Clearance issues	[C.I.C]	Per Span	• Based on historical cost of rectifying line clearance issues.
High Voltage Underground Cable Installation Program	Replacement of High Voltage Aerial Bundled Cable with High Voltage Underground cable	[C.I.C]	Per km	• Based on forecast expenditure from the current High Voltage Underground Cable Installation Program