Cost estimation methodology & approach

Prepared for the 2024-29 regulatory period

PowerWater

Contents

Executive summary

The cost estimation methodology and approach outlines the steps taken by Power and Water to ensure that its capital expenditure reflects efficient costs. In addition, it includes discussion of the approach taken for the 2024-29 regulatory period, including basis for accuracy and adjustment to the estimation processes relied upon for the capex forecast.

Power and Water uses estimates to forecast resource requirements, as well as to enable the management of project costs throughout the program and project lifecycles. Specifically, the estimation systems used by Power and Water cover a wide range of projects from standardised projects and programs characterised by high volume, short cycle, low cost; to more complex projects characterised by low volume, long duration and high cost.

Firstly, Power and Water has developed unit costs based on the best estimate of resources to deliver a task based on known costs and work practices. Unit costs have been developed using two approaches:

- Standard unit costs: Derived from analysis of historical actual costs for the different types of capital works required on the regulated network for application to the 2024-29 regulatory period. This was based on actual historical capital expenditure data incurred between July 2017 (FY18) and June 2021 (FY21). The data relied upon is also used as the basis of the expenditure reported for the annual RINs.
- Project specific unit costs: Developed from updated information where available. Circumstances where this approach would be used include when the asset type is not included in our historical data. The alternative unit rate is considered to be more reflective of the efficient cost that will be incurred during the next regulatory period, or an updated unit rate is obtained from market processes.

These unit costs are then applied as part of our estimation methodology to estimate the forecast capex requirements. Power and Water organises these into three principal methods:

- Specified projects which are developed from a bottom-up estimating process based on the project's defined scope of work or through market quotations and vendor pricing, particularly where a competitive tender process is undertaken.
- A program of work involving a high volume of assets that have low individual costs. Programs typically rely on inspections not yet conducted, short notification times, unknown scope or unknown location of works into the future. The approach to forecasting the volumes varies by asset class and is described in the Regulatory Business Case.
- Standard jobs which relate to repeated maintenance activities and have well defined scope and schedule.

Power and Water's network is located in a harsh natural environment that includes heat, humidity, monsoons, fauna and flora that put pressure on distribution assets. Like other DNSPs, many of the challenges are similar. However, Power and Water's response to these challenges due to the specific local conditions often differs from other DNSPs. High-level cost benchmarking was undertaken to identify specific drivers of costs, and areas for improvement.

For the 2024-29 regulatory period, Power and Water has also used a combination of market-based estimates, quotes and estimates from providers and application of independent benchmarks to reflect the efficient level of costs forecast to be incurred. In addition, the justification for all projects and programs has been articulated in a Regulatory Business Case (RBC). The RBC provides the evidence of prudent and efficient decision making as required under the NT National Electricity Rules.

Consistent with the Project Investment Delivery Framework (PIDF), the portfolio of projects and programs (comprising each of the RBCs) are approved by the Enterprise Portfolio Management Committee (EPMC). This approval provides the executive oversight of the proposed portfolio of works for the 2024-29 regulatory period.

The portfolio has also been subject to a separate governance process, for the purpose of review and approval of the regulatory submission and supporting information at Executive and Board level.

1. Introduction

The purpose of this document is to describe the cost estimation methodology and approach taken by Power and Water for the proposed expenditure included for the 2024-29 regulatory period.

Cost estimates are used by Power and Water to forecast resource requirements (Materials, Labour and Contract), as well as to enable the management of project costs throughout the program and project lifecycles. Specifically, the estimation systems used by Power and Water cover a wide range of projects from standardised projects and programs characterised by high volume, short cycle, low cost; to more complex projects characterised by low volume, long duration and high cost.

The cost estimation methodology & approach described herein provide confidence to the Power and Water Board and Shareholder that capital investments made by Power and Water reflect efficient costs. In addition, it will serve to inform regulators and other stakeholders of the processes by which Power and Water undertake to use and maintain its estimation processes.

The details contained in this document are based on the information available at the time of preparing this document.

The subsequent sections include:

- Section 2, provides a summary of the development of unit costs.
- Section 3, provides a summary of how unit costs are used by Power and Water to developing the cost estimates for the forecast capex requirements.
- Section 4, outlines drivers of costs in the Territory which are likely to impact unit costs when compared with other jurisdictions.
- Section 5, introduces the approach applied for the 2024-29 regulatory period, including adoption of the regulatory business case and approval process.

Also, the following appendices are provided:

- Appendix A, provides a list of the standard unit costs and shows the historical volumes of replacement for each asset class.
- Appendix B, provides the results of the correlation between volumes and costs that was undertaken to understand the strength of the relationship between unit costs and the scale of the network.
- Appendix C, provides a comparison of Power and Water's historical unit costs with 10 peer DNSPs in the NEM.
- Appendix D, provides the basis for cost estimates by category as required as part of the Reset RIN.

2. Unit cost methodology

The Unit Cost methodology utilises the quantity of units delivered (physicals) and the total cost delivered (contract, materials and labour) to derive an average Unit Cost.

Unit Costs are created based on the best estimate of resources to deliver a task based on known costs and work practices. The initial estimate is improved over time based on actual cost and changes in work practices or other input costs. The goal of the Unit Cost methodology is to establish the efficient cost of delivering work.

2.1 Unit costs

Power and Water reviews the Unit Cost performance of activities undertaken as part of its programs of work each year to:

- determine the effectiveness of efficiency measures introduced as part of operational continuous improvement processes;
- assess cost impacts due to changes in engineering standards or work practices;
- to determine other specific operational conditions (e.g. due to local constraints or variations in sourcing contracts); and
- identify efficient practices across regions.

Where specific drivers are identified that have led to an increase in the unit cost, improvement programs can be developed to improve the efficiency of the activity and implement cost reduction strategies where applicable.

Where new projects or activities are developed or introduced, and no historical data is available to inform the unit cost to complete the works, subject matter experts are used to advise on the estimated costs to complete those works.

2.2 Determining standard unit costs

Power and Water has undertaken an analysis of historical actual costs for the different types of capital works required on the regulated network to develop 'standard' unit costs for application to the 2024-29 regulatory period.

The review was based on the actual historical capital expenditure data incurred between July 2017 (FY18) and June 2021 (FY21). The data relied upon is also used as the basis of the expenditure reported for the annual RINs.

To ensure that the data best reflects the future needs of the business several adjustments were required. These were primarily to correct for anomalies present in the cost information derived from RIN reporting and which did not accurately reflect the basis for future costs. These changes can be summarised as:

- Escalated the expenditure into FY22 dollars so it is on the same dollar basis as the forecast and can be directly compared.
- Adjusted the labour rate used for historical projects to reflect the current and future labour rate assumptions. Labour rates were changed as a result of the new operating model and which has resulted in an increase to historical unit costs compared to the historical RIN..

- Excluded projects that were missing costs or volumes for the analysis period.[1] The reason for this is that often there are costs incurred during a project across a period of time but the assets are only recognised upon commissioning and completion. Hence, not making this adjustment will result in a mis-match of costs and volumes and distort the apparent unit costs. This is a significant issue for Power and Water as a small network with volatile capital expenditure requirements at an asset class level.
- Implemented manual adjustments to correct for:
  - known issues in the base data;
  - where there were inexplicably high or low unit costs that indicate an error or small sample of assets; and
  - adjustments for the asset types actually used on our network compared to the RIN categories.

Unit costs were then developed from this dataset, as being reflective of the costs that Power and Water would incur in the future. The unit costs developed by this method are referred to as the 'standard' unit costs. A summary of the standard unit costs applied for the 2024-29 regulatory period are provided in Appendix A.

2.3 Project specific unit costs

To enable a flexible approach to the application of unit costs in business cases, the standard unit costs in Appendix A were used as the default. However, where updated information is available a project specific unit cost is applied. This includes where:

- The asset type is not included in our historical data so applying a standard rate would not result in an efficient outcome; and/or
- The alternative unit rate is considered to be more reflective of the efficient cost that will be incurred during the next regulatory period. This may be due to specific rates that are part of a long-term contract.
- An updated unit cost is obtained from market processes, such as a quote from a vendor.

In these cases, the unit cost will be specified directly in the corresponding business case. In general, the project specific unit cost is likely to be, on average, lower than the default standard unit cost.

Project specific unit costs are typically used for non-network projects.

[1] For the absence of doubt, only projects that included both costs and asset volumes recorded within the four year analysis period were retained.

3. Estimation methodology

3.1 General

The Estimation methodology is how the Unit Costs discussed above are used in developing the cost estimates for the forecast capex requirements. Power and Water organises these into three principal methods: (i) Specified projects, (ii) Program of works, and (iii) Standard jobs.

The decision as to which method is applied depends on the degree of certainty in the project scope and timing and is discussed in the corresponding business case. Each method is set out below.

3.2 Specified projects

For a specified project or investment, a cost estimate is developed as part of developing a business case.

The cost estimate can be either:

- developed from a bottom-up estimating process, comprising itemised labour, materials, equipment and contract services required to deliver the project's defined scope of work; or
- based upon market quotations and vendor pricing, particularly where a competitive tender process is undertaken.

As a specified project progresses, it moves through each of the lifecycle steps as described in the Project Investment Delivery Framework (PIDF).

The gated governance methodology is designed to manage uncertainties and risks associated with the project at regular intervals. This is achieved by building in review of proposed expenditure for prudency and efficiency at each gate as the project moves through the investment lifecycle. Accordingly, the accuracy of the cost estimate increases as the project moves through each gate.

3.3 Program of work

For routine and recurring works, where the scope and timing of that work is not certain, a program of works may be relevant. Programs of work apply to high volume/low cost repeatable investments or where there is some uncertainty owing to a reliance of inspections not yet conducted, short notification times, unknown scope or unknown location of works into the future.

This is most relevant to repex projects and programs and some smaller augex-related programs and small connection programs.

The basis for the forecast expenditure for each program is a forecast of volumes (which may be based on, for example, historical volumes) multiplied by unit cost(s). This unit cost is an estimate of cost based on a combination of approaches and defined as a program (cost) estimate.

The approach taken to develop each program estimate depends on the availability, comparability, and granularity of historical data and is either the default unit cost based on historical costs, or a project specific unit cost (as described in the previous section).

3.4 Standard Jobs

Repeated maintenance activities are programmed and initiated via maintenance scheduled tasks (MSTs). MST's range from periodic inspections to condition-based maintenance triggers across a wide range of network components and are often geographic or equipment specific.

This is most relevant to fault and maintenance-related programs.

Associated with each MST is a standard job, which includes a labour and contract estimate for the works triggered by the MST. There may be a one to one relationship between an MST and a standard Job, or many to one relationship, with many MST's associated with a single standard job.

Additionally, standard jobs may be used for capital works not triggered by a MST. These include high volume, low complexity frequently repeated standardised activities with single workgroup labour/contractor estimate requirements. In these instances, the use of a standard job to estimate the works and create works orders is the most efficient approach.

Standard jobs do not contain materials. As required, these are estimated separately using appropriate compatible units in an associated estimate or are requisitioned directly from stores.

Standard jobs have been specifically developed to enable:

- The efficient initiation of works within the works management system for repeated activities undertaken by a single workgroup. In addition, updates or maintenance to the estimate requirements within a standard job automatically reflects in any subsequent work order where it's used.
- Direct creation of work orders and tasks, including associated work instructions, initiated by a MST for the activity.
- The provision of a 'template' of a work order and tasks, by recording the details of the tasks to be undertaken in a form that can be readily reproduced as often as necessary. This ensures the correct instructions are supplied with the job, including specific consumables requirements if any.

There are two key aspects associated with standard jobs which distinguish them from estimates:

- Works orders generated from Standard Jobs include the details of the tasks to be undertaken, such as a work instruction regarding process steps associated with maintenance of a specific circuit breaker.
- Standard jobs can only be used for the creation of a single works order, whereas estimates can be used to create as many work orders as required.

4. Unique drivers of cost

Power and Water's network is located in a harsh natural environment that includes heat, humidity, monsoons, fauna and flora that put pressure on distribution assets. The Northern Territory is subject to Australia's highest:

- Frequency of lightning. Lightning strikes result in surges that can cause damage to assets and can result in immediate failure and can restrict our access to assets for obvious safety reasons.
- UV intensity. UV light degrades polymer materials with higher intensity causing more rapid degradation.
- Rainfall and humidity. Water ingress into assets accelerates deterioration, corrosion and results in early asset failure. The rainfall also makes access to assets and undertaking maintenance more difficult.
- Average temperatures which:
    - reduces the efficiency of cooling and limits the capacity of assets. Particularly high underground temperature reduces the current carrying capacity of cables, either reducing the power transfer or requiring larger cables to be installed (resulting in higher capex and repex).
    - reduces the productivity of field crews due to the effect of heat on physical labour[2].

Further, throughout the Northern Territory there are issues with weather, fauna and flora damaging assets. Common fauna related issues include:

- Large populations of larger animals, such as snakes, bats and birds cause faults and damage on overhead conductors and insulators.
- Bats are significant issue during migration periods (often multiple periods each year) and commonly cause phase to phase and phase to earth faults as they hang between conductors or aggregate on crossarms.
- Very aggressive termites and boring insects which eat through external sheaths of cables and cause failures. Termite mounds are commonly found within distribution enclosures, such as distribution pillars, causing additional maintenance and replacement.
- During the dry season, small snakes and frogs commonly enter cable termination compartments in switchgear for warmth causing flashovers that can often damage switchgear beyond economical repair.
- Cyclones occur periodically in the Northern Territory and result in a combination of high volumes of rain and strong winds. The rain can weaken the integrity of the ground and result in the failure of footings. This is combined by the high wind loading and external impacts from trees and debris. Cyclones typically require an emergency response to restore power supply.

[2] Labour Efficiency and Work Management in Hot Humid Climates, Thermal Hyperformance

Each of the environmental and fauna related issues listed above impact the asset specifications and the duration required to install the assets, hence affecting the unit cost.

Additional factors that impact materials selection and the labour cost component of asset unit costs include:

- Bushfires – while not extreme like in the South East of Australia – they are frequent and burn approximately a third or more of the NT each year.[3] This affects the type of assets that can be installed and vegetation management practices around assets outside of urban areas to limit fire damage.
- Distance – with three separate networks through the Northern Territory, the time required to access remote assets impacts the labour cost attributed to the unit cost.
- Accessibility – access to our assets is further impeded during monsoons where some assets can be cut off from access for prolonged periods of time. The functional requirements and specifications of the assets must be suitable for long periods of isolation which can affect the average unit costs.

Like other DNSPs, many of the challenges are similar. However, Power and Water's response to these challenges due to the specific local conditions often differs from other DNSPs. Power and Water may be considered as most comparable to:

- SA Power Networks in terms of distances and material requirements; and
- Ergon Energy with respect to the tropical climate and fauna.

Benchmarking unit costs can be a useful and insightful exercise to assist identify specific drivers of costs. An analysis taken from published RIN information is provided in Appendix B and Appendix C.

[3] This can be up to 50% on savannah, see https://www.aic.gov.au/sites/default/files/2020-07/tbp027_09_nt.pdf

5. Approach for 2024-29 regulatory period

5.1 Introduction of a regulatory business case

Power and Water has developed a 'Regulatory Business Case (RBC)' for supporting the justification for all projects and programs to be included into the expenditure forecast for the 2024-29 regulatory period.

The RBC will be set out to directly address the capex criteria and provide the information required under the NT NER. It will be completed for each project and program. This will provide evidence of prudent and efficient decision making.

The RBC is considered consistent with the Business Need Identification (BNI) identified in the PIDF.

The RBC will then be used as a part of the standard gated approval process as described in the PIDF. Importantly the RBC will clearly denote that approval is granted for inclusion in the regulatory submission only, and that a separate request for seed funding shall be entered into.

Consistent with the PIDF, the portfolio of projects and programs are approved by the EPMC based on the portfolio being the prudent and efficient level of expenditure to manage the network. This approval is only for inclusion in the IRP – but provides the executive oversight of the proposed portfolio of works consistent with the objectives of the PIDF. The program is also subject to a separate governance process for review and approval of the regulatory submission at Executive and Board level.

Each project and program will remain subject to the BAU governance processes described in the PIDF prior to implementation, noting that the information available in the RBC will be sufficient to address most of the BAU requirements.

This approach will provide a detailed justification for all projects and programs that can be used as the basis for the PBC or Final BC in the approval process, therefore facilitating the BAU project approvals processes.

In Appendix D, the basis for cost estimates by category as required as part of the Reset RIN is provided.

5.2 Cost estimate accuracy

All projects in the capex forecast are based on a cost estimate and include a RBC, where they are forecast to commence in the 2024-29 regulatory period.

Cost estimates provide consolidation of all direct and known project costs and effort (e.g. collated labour hours, materials, equipment and contractor costs derived from compatible units utilised in an estimate) and, where appropriate, unknown costs and uncertainty (risk based)

Consistent with the requirements of the BNI, the cost estimate has an accuracy of +/-35%.

For PBC and final BC, the cost estimation approach including use of the cost estimate template shall also incorporate the requirements of the PIDF.

5.3 Risk allowance and cost contingency

Any risks should be defined with specific costs allocated to them.[4] A risk allocated cost contingency should be included in the total project cost estimate for the mitigation of significant risks. Risk management and

[4] Also refer to the Project Planning procedure, risk and contingency quantification

contingency funding can be utilized to mitigate those risks that cause cost escalations throughout the project.

During the preparation of the initial estimate, a risk assessment should be performed on the project in order to define and quantify the potential risk areas and types. Some examples of risk assessment areas may include the analysis of differing site conditions, utility impacts, hazardous materials, environmental considerations, third-party concerns, etc.

Except where specifically stated, there is no general provision for risk allowance or cost contingency included in the cost estimates.

5.4 Market based estimates

Where the services included in the project cost estimates are not available from the existing supplier arrangements, a market estimate or quotation may be sought. All such requests must comply with Power and Water's Procurement policy.

Quotations recently received from vendors may also be used to inform similar projects as either the total project cost or an input as part of the project cost build up.

5.5 Estimates obtained from contractors or manufacturers

For specific tasks or equipment types, Power and Water may obtain quotes or estimates from individual contractors or equipment manufacturers. These quotes can then be used as part of a detailed cost build up for a specified project or multiplied out by volumes forecast under a program of works.

These estimates and quotes may be sought for a specific project or Power and Water may apply recently received quotes for similar work.

5.6 Estimates based on independent benchmarks

Where the services included in the project cost estimates are not available and it is not practicable to obtain quotes from vendors, for example, if detail specifications are required for vendors to provide a quote, Power and Water may undertake analysis of projects from other business through publicly available data and/or contacts within industry to validate the expect cost of the project.

5.7 Cost escalation

5.7.1 Real cost escalation

Power and Water, like other network businesses, are experiencing increases to its costs and expect that this trend will likely continue into the 2024-29 regulatory period as a result of current market conditions and global events. However, we have not included any real increase in materials or services costs at a project level or at the portfolio level in the capex forecast.

Power and Water has included labour cost escalation at the portfolio level in the capex forecast based on advice from BIS Oxford dated 2022. This approach is considered representative of the increased costs that Power and Water can reasonably expect to incur in the 2024-2029 regulatory control period.

5.7.2 Adjustment for 2021/22

Power and Water, like other network businesses, has experienced real cost increases of materials and assets during the past year.

The unit costs calculated by Power and Water that were applied to develop the capital forecast were based on the average expenditure per RIN asset category for the four-year period from FY18 through to FY21 (inclusive). Hence, the impact of the cost increases experienced in FY22 had been excluded from the derivation of standard unit costs.

Advice from BIS Oxford dated 2022 identified that the real cost of materials required for electrical installations had a step increase above to CPI of up to 26% from FY21 to FY22. Power and Water considers it reasonable to recognise:

- An increase in the cost of materials has been incurred by the business.
- This cost was not included in the derivation of the standard unit costs, and which are relied upon as the basis for future costs.
- The increase in costs is limited to materials costs.

Accordingly, Power and Water has applied an adjustment at the portfolio level. The adjustment uses the average of the real costs increases reported by BIS Oxford to the materials related costs in FY22.

The data was only made available following the development of the business cases. It was not possible to amend the unit costs relied upon for each of the projects and programs. The adjustment has therefore been applied at the portfolio level to the materials component of the forecast costs.

Appendix A. Standard unit costs

The standard unit costs applied for the capex forecast included in the 2024-29regulatory period are provided in the tables below.

- Table 1 provides the detail of our standard unit costs, including the split between materials, internal labour and external labour.
- Table 2 shows the historical volumes of replacement for each asset class.

Table 1: Unit costs by RIN category

RIN Group	RIN Category	Labour	Materials	Contract	Total	Comment
Cables	> 1 kV & < = 11 kV	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Cables	> 11 kV & < = 22 kV	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Cables	< = 1 KV	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Cables	> 33 kV & < = 66 kV	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Conductors	> 1 kV & < = 11 kVc	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Conductors	> 11 KV & < = 22 KV ; MULTIPLE-PHASE	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Conductors	< = 1 KVC	[redacted]	[redacted]	[redacted]	[redacted]	per metre
Services	< = 11 KV ; RESIDENTIAL ; SIMPLE TYPE	[redacted]	[redacted]	[redacted]	[redacted]	per service not per metre
Poles	> 1 kV & < = 11 kV; STEEL	[redacted]	[redacted]	[redacted]	[redacted]	Some outliers in the data, use the 22kV rate for both 11 and 22kV
Poles	> 11 kV & < = 22 kV; STEEL	[redacted]	[redacted]	[redacted]	[redacted]	
Poles	< = 1 KV; STEEL	[redacted]	[redacted]	[redacted]	[redacted]	Used weighted average of LV pole and service pole
Transformers	GROUND OUTDOOR / INDOOR CHAMBER MOUNTED; < 22 KV ; > 60 KVA AND < = 600 KVA ; MULTIPLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	
Transformers	GROUND OUTDOOR / INDOOR CHAMBER MOUNTED; < 22 KV ; > 600 KVA ; MULTIPLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	Not enough data, use the <600 rate increased by 10%

Transformers	GROUND OUTDOOR / INDOOR CHAMBER MOUNTED; > = 22 KV & < = 33 KV ; < = 15 MVA	[redacted]	[redacted]	[redacted]	[redacted]	No data, use the 11kV <600 rate
Transformers	KIOSK MOUNTED ; < = 22kV ; > 60 kVA AND < = 600 kVA ; MULTIPLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	Typically like for like replacement
Transformers	KIOSK MOUNTED ; < = 22KV ; > 600 KVA ; MULTIPLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	
Transformers	POLE MOUNTED ; < = 22KV ; < = 60 KVA ; MULTIPLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	
Transformers	POLE MOUNTED ; < = 22KV ; > 60 KVA AND < = 600 KVA ; MULTIPLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	
Transformers	POLE MOUNTED ; < = 22kV ; > 60 kVA AND < = 600 kVA ; SINGLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	Suspect data issue, shouldn't be any single phase > 60kVA. Used the multiple phase rate
Transformers	POLE MOUNTED ; < = 22kV ; > 600 kVA ; Multiple Phase	[redacted]	[redacted]	[redacted]	[redacted]	Not enough data, use the <600 rate increased by 10%
Transformers	POLE MOUNTED ; < = 22kV ; < = 60 kVA ; SINGLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	Not enough data, use the multiple phase rate decreased by 20%
Transformers	KIOSK MOUNTED ; < = 22KV ; < = 60 KVA ; SINGLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	
Transformers	KIOSK MOUNTED ; < = 22KV ; > 60 KVA AND < = 600 KVA ; SINGLE PHASE	[redacted]	[redacted]	[redacted]	[redacted]	
Switchgear	< = 11 KV ; SWITCH	[redacted]	[redacted]	[redacted]	[redacted]	Used weighted average of GBS, RMU and HZ
Switchgear	> 11 KV & < = 22 KV ; SWITCH	[redacted]	[redacted]	[redacted]	[redacted]	Used weighted average of GBS, RMU and HZ
Switchgear	< = 11 KV ; CIRCUIT BREAKER	[redacted]	[redacted]	[redacted]	[redacted]	
Switchgear	> 11 kV & < = 22 kV ; CIRCUIT BREAKER	[redacted]	[redacted]	[redacted]	[redacted]	

Other	Metering Units	[redacted]	[redacted]	[redacted]	[redacted]	
Other	Pillars	[redacted]	[redacted]	[redacted]	[redacted]	
Poletops	> 11 kV & < = 22 kVp	[redacted]	[redacted]	[redacted]	[redacted]	
Poletops	> 1 kV & < = 11 kVp	[redacted]	[redacted]	[redacted]	[redacted]	Raw calculated considered excessive. Substituted with >11kV rate
Poletops	> 22 kV & < = 66 kVp	[redacted]	[redacted]	[redacted]	[redacted]	
Poletops	> 66 kV & < = 132 kVp	[redacted]	[redacted]	[redacted]	[redacted]	Remove impact of outlier, reduce by 25%
Poletops	< = 1 kVp	[redacted]	[redacted]	[redacted]	[redacted]	

Table 2: Historical volumes by RIN category

Final Asset Class	RIN Replacement Asset Category	2017/18	2018/19	2019/20	2020/21	Avg p.a.	Comment
Cables	< = 1 KV	362	123	279	883	412	metres
Cables	< = 11 KV ; RESIDENTIAL ; SIMPLE TYPE			1	5	3	per service
Cables	> 1 kV & < = 11 kV	649	1037	32	4207	1481	metres
Cables	> 11 kV & < = 22 kV	100	82	0	276	114	metres
Cables	> 33 kV & < = 66 kV			0		0	metres
Conductors	< = 1 KVC	2109	2285	20	239	1163	metres
Conductors	< = 11 KV ; RESIDENTIAL ; SIMPLE TYPE		5	0	1	2	per service
Conductors	> 1 kV & < = 11 kVc	4023	0	0	459	1120	metres
Conductors	> 11 KV & < = 22 KV ; MULTIPLE-PHASE	493	601	748	1360	801	metres
Distribution Poles	< = 1 KV; STEEL	15	15	3	9	11	metres
Distribution Poles	> 1 kV & < = 11 kV; STEEL	3	4	5	18	8	
Distribution Poles	> 11 kV & < = 22 kV; STEEL	13	11	0	17	10	
Distribution Substations	GROUND OUTDOOR / INDOOR CHAMBER MOUNTED; < 22 KV ; > 60 KVA AND < = 600 KVA ; MULTIPLE PHASE	5	2	1	1	2	
Distribution Substations	GROUND OUTDOOR / INDOOR CHAMBER MOUNTED; < 22 KV ; > 600 KVA ; MULTIPLE PHASE	3	1	0		1	
Distribution Substations	GROUND OUTDOOR / INDOOR CHAMBER MOUNTED; > = 22 KV & < = 33 KV ; < = 15 MVA		0		0	0	

Distribution Substations	KIOSK MOUNTED ; < = 22KV ; < = 60 KVA ; SINGLE PHASE	1	1	0	2	1	
Distribution Substations	KIOSK MOUNTED ; < = 22kV ; > 60 kVA AND < = 600 kVA ; MULTIPLE PHASE	26	11	1	9	12	
Distribution Substations	KIOSK MOUNTED ; < = 22KV ; > 60 KVA AND < = 600 KVA ; SINGLE PHASE	2	0	1	4	2	
Distribution Substations	KIOSK MOUNTED ; < = 22KV ; > 600 KVA ; MULTIPLE PHASE	1	1	1	1	1	
Distribution Substations	POLE MOUNTED ; < = 22kV ; < = 60 kVA ; SINGLE PHASE			0		0	
Distribution Substations	POLE MOUNTED ; < = 22kV ; > 60 kVA AND < = 600 kVA ; SINGLE PHASE	0				0	
Distribution Substations	POLE MOUNTED ; < = 22kV ; > 600 kVA ; Multiple Phase	1				1	
Distribution Substations	POLE MOUNTED ; < = 22KV ; < = 60 KVA ; MULTIPLE PHASE	10	12	1	7	8	
Distribution Substations	POLE MOUNTED ; < = 22KV ; > 60 KVA AND < = 600 KVA ; MULTIPLE PHASE	51	20	7	47	31	
Distribution Switchgear	< = 11 KV ; CIRCUIT BREAKER		0			0	
Distribution Switchgear	< = 11 KV ; SWITCH	34	36	9	28	27	
Distribution Switchgear	> 11 kV & < = 22 kV ; CIRCUIT BREAKER	6	0	0	8	4	
Distribution Switchgear	> 11 KV & < = 22 KV ; SWITCH	9	13	2	9	8	
Metering Units	Metering Units	2	0	0	2	1	
Pillars	Pillars	72	51	6	33	41	
Poletops	< = 1 kVp	22	4	0		9	
Poletops	> 11 kV & < = 22 kVp	74		0	69	48	

Poletops	> 1 kV & < = 11 kVp	63	20	0	0	21	
Poletops	> 22 kV & < = 66 kVp		14	0	4	6	
Poletops	> 66 kV & < = 132 kVp		8	0	1	3	
Grand Total		**8,149**	**4,356**	**1,117**	**7,699**		

Appendix B. Correlation of volumes and cost to unit costs

To understand the strength of the relationship between unit costs and the scale of the network, an assessment of the correlation of volumes and costs was undertaken.

Correlation is not a perfect measure as it is affected by factors that are unique to each DNSP and the data available, and not purely the volume of assets installed, such as:

- internal processes of each DNSP
- effects of the network geography and local conditions
- design standards/asset functional requirements
- availability of sufficient data per category and consistency in the definition of the data reported
- similarity of the composition of the asset category (ie switchgear of the same voltage level and type, or transformers of the same capacity).

However, it is a useful metric to assess how prominent a trend may be and help explain differences in unit costs experienced across the networks. The implication of correlation is a demonstratable mathematical relationship between cost and quantity.

A correlation of 100% means there is a perfect relationship between two variables, a correlation of –100% means there is a perfectly inverse relationship between two variables, and a correlation of zero means there is no correlation at all. Our analysis found the correlations shown in Table 1.

Table 3 Correlation of unit rate to volumes by asset class

Asset class	Correlation	Comment
Steel pole	27%	Small data set so not likely to be reliable
Pole Tops	-38%	
LV Conductor	-25%	
HV Conductor	-59%	
LV Cables	-40%	
HV Cables	-42%	
Services	-64%	
Pole Distribution substation	-34%	
Kiosk Distribution substation	-20%	
Ground Distribution substation	24%	
Distribution switchgear	-62%	
Zone substation switchgear	-55%	

Intuitively, and as shown in Table 3, a negative correlation between volumes and unit costs is expected as this demonstrates that economies of scale can be achieve by larger networks and which has the affect of reducing unit costs.

Conversely, higher unit costs for smaller networks are not necessarily due to inefficiencies, but more likely to be the result of lower ability to obtain economies of scale due to smaller replacement programs, and networks.

Economies of scale can be achieved through:

- a sufficiently large volume of works such that a dedicated crew(s) can be assigned to the program, increasing their productivity and minimising the impact of fixed costs on an individual unit cost.
- packaging a large volume of works into a package and running a market tender to drive efficiencies through a competitive process.

There are barriers to Power and Water realising the economies of scale that are present in other networks. Firstly, the volume of works is generally too low and the workforce too small to enable dedicating a crew(s) to a single program. Secondly, there is a limited market of suppliers to maximise the benefits of a fully competitive tender process.

However, Power and Water will seek market based opportunities where possible to drive efficiencies in the delivery of the capital works program. For example, the recent civil contract for HV cable replacement included a volume of work that allowed a competitive tender process to be undertaken, and selection of a panel of providers resulting in lower costs.

Appendix C. Unit cost benchmarking

C.1 Overview

To understand the relative efficiency of Power and Water's unit costs the historical unit costs were benchmarked against 10 peer DNSPs in the NEM.

The DNSP unit costs are often not directly comparable to Power and Water's unit cost due to a number of factors as discussed in this document. However, the exercise provides a useful reference from which to better understand the drivers of cost at Power and Water. Further, that opportunities can be identified to place downward pressure on unit costs where relevant.

Noting the above limitations, and after accounting for the differences in asset materials/construction, operating environment factors and low volumes delivered, the unit costs are considered reasonable.

C.2 Approach

For each of the DNSPs, a unit cost was calculated based on the Category Analysis RIN Table 2.2.1 data by summing all CPI adjusted expenditure for FY18 to FY21 (inclusive) and dividing it by all asset replacement volumes across the same time period. Power and Water data was developed on the same basis for comparison.

In addition, as described in section 2.2 adjustments were required to the historical data to correct for anomalies present in the cost information derived from RIN reporting. The adjusted unit cost was identified as PWC (Adj) values in the benchmarking analysis.

Abbreviation	DNSP	Abbreviation	DNSP
AGD	Ausgrid	JEN	Jemena
AND	AusNet Distribution	PAL	Powercor Australia Limited
AVE	Average of the DNSPs where the cost or volume > 0	PWC (Adj)	Power and Water Corporation adjusted for anomalies described in section 2.2
EGX	Energex	PWC	Power and Water Corporation
END	Endeavour Energy	SAPN	South Australia Power Networks
ERG	Ergon Energy	UED	United Energy Distribution
ESS	Essential Energy		
EVO	EvoEnergy		

The following businesses were excluded from the above analysis:

- CitiPower was excluded due to significant differences in the network topology (being predominately CBD and underground)
- TasNetworks was excluded due to significant differences in climate and terrain
- Transmission businesses were excluded. While Power Water has assets classed as transmission, they are only 66kV and 132kV which are typically considered as sub-transmission in other DNSPs in

the NEM and are very different to other transmission businesses assets so would not provide a fair comparison.

The following sections describe our findings by key asset category. In each chart, the unit costs are presented in decreasing magnitude. The volume of asset replacement for each DNSP is expressed as a percentage of the highest asset replacement volume amongst the peer DNSPs for that asset category.

C.3 Steel poles

This asset class is comprised of only steel poles. Due to environmental (cyclone and bushfire[5]) and fauna (termite) issues, Power and Water only uses steel poles on the network. This is different to other DNSPs where wood or concrete poles are the primary asset type.

SAPN is another business with a high volume of steel poles. However, SAPN employs a different type of pole design. They use 'Stobie' poles which are a combination of steel and concrete.

Our benchmarking shows that while the PWC (Adj) unit cost is above the NEM average unit cost, it is only approximately 10% higher than SAPN which provides the most similar asset type comparison, and lower than Ergon which provides the most similar environmental conditions.

The lower volumes of poles undertaken by Power and Water are also likely to lead to lower economies of scale compared with other DNSPs. However, the data sample did not demonstrate significant correlation and therefore did not clearly show economies of scale could drive unit cost reductions. This is likely due to the low volumes and different construction types of steel poles across the DNSPs.

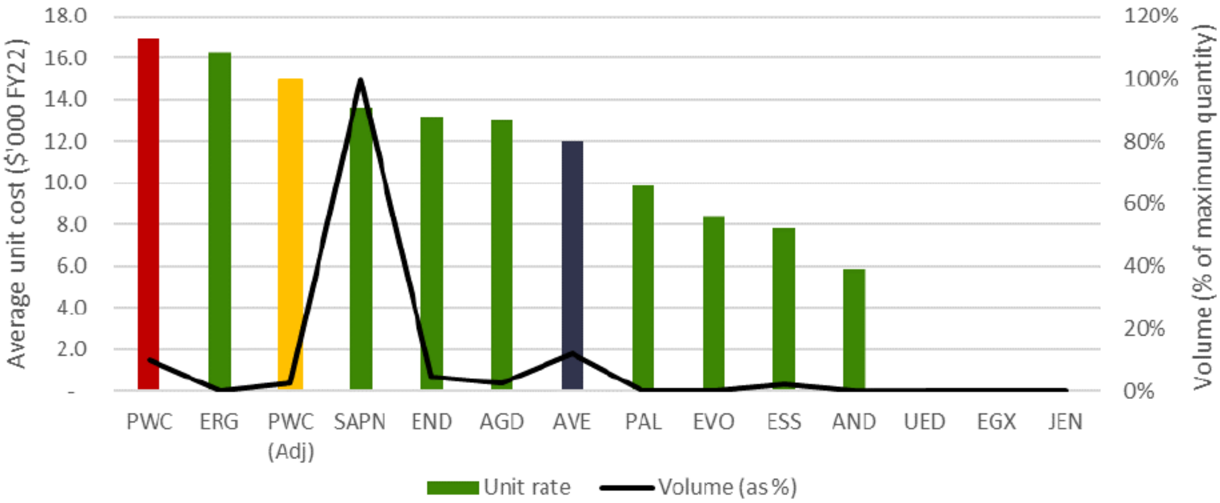

Figure 1 Steel poles

C.4 Pole tops

The pole tops used by Power and Water are constructed of hollow steel (square) tube and are welded to the pole. This is a significantly different construction method compared to other DNSPs which use a mixture of wood and steel cross arms that are typically secured to the pole by bolts.

[5] Approx 33% of the territory burns annually through minor fires and traditional owner/land management burnings. Hence, wood poles are not suitable for this environment.

When changing cross arms, Power and Water must first remove the cross arm through grinding away the welded joint or cutting off the cross arm and then welding on the new one. This represents a significant increase in workload compared to a cross arm attached by bolts.

The benchmark data shows that when calculated on the historical RIN data, Power and Water is shown to have a unit cost below the average unit cost.

However, after adjusting the data based on more detailed assessment, Power and Water is shown to be in the upper quartile of DNSPs. Given the more difficult scope of changing cross arms for Power and Water, this result appears reasonable.

There is a much more significant correlation (-38%) between volumes delivered and unit cost for this asset class which indicates that the large networks are benefiting from economies of scale that are not available to Power and Water. It is noted that JEN and EVO are two other small networks which also have higher unit cost and low volumes.

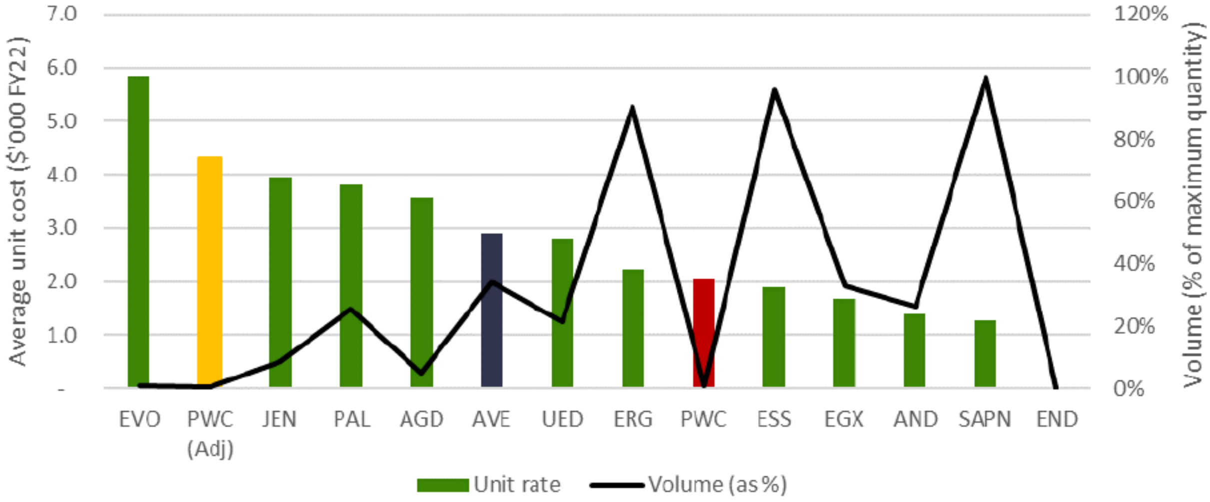

Figure 2 Pole tops

C.5 LV Conductor

LV conductor is fairly standard across DNSPs and shows a moderate correlation (-36%) between volumes and unit rate, indicating some level of economies of scale.

The historical unit cost for PWC is consistent with Powercor and Energex and less than 20% above the average unit cost. The data for EvoEnergy was an outlier and was excluded from the analysis of this asset class.

However, when adjusted due to more detailed analysis of each of the line items, the unit cost has increased. On closer analysis, the unit cost for LV Conductor is comprised of approximately 90% labour. The likely reason for the higher unit cost for PWC (Adj) is the incrementally higher labour costs associated with the operating environment factors impacting working conditions (e.g. high heat and humidity) in the Northern Territory.

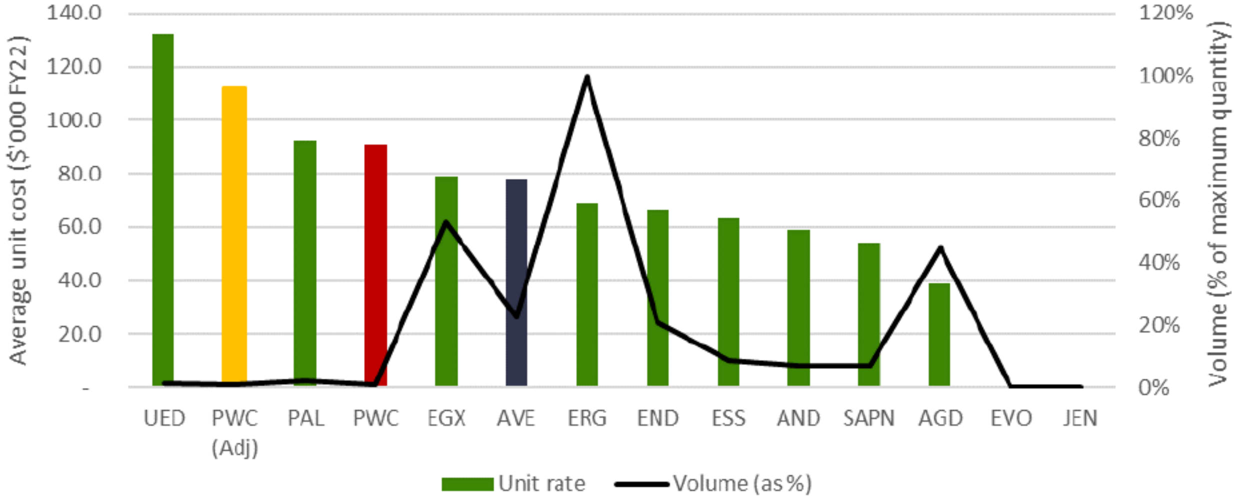

Figure 3 Low voltage (LV) conductor

C.6 HV Conductor

HV conductor is fairly standard across DNSPs and shows a very high correlation (-87%) between volumes and unit rate, indicating a strong degree of economies of scale achievable for this asset class. However, other factors such as design standards and conductor type and materials (ie, ABC, AAC, ACSR, CU) can also have a high influence on the unit costs. This information is not available from the RIN data.

The historical unit cost for PWC is consistent with AusNet Distribution and Energex and approximately 15% above the average unit cost. The data for EvoEnergy was an outlier and was excluded from the analysis of this asset class.

However, when adjusted due to more detailed analysis of each of the line items, the unit cost has increased. As for LV conductor, this unit cost is similarly comprised of 90% labour and therefore subject to the same cost factors.

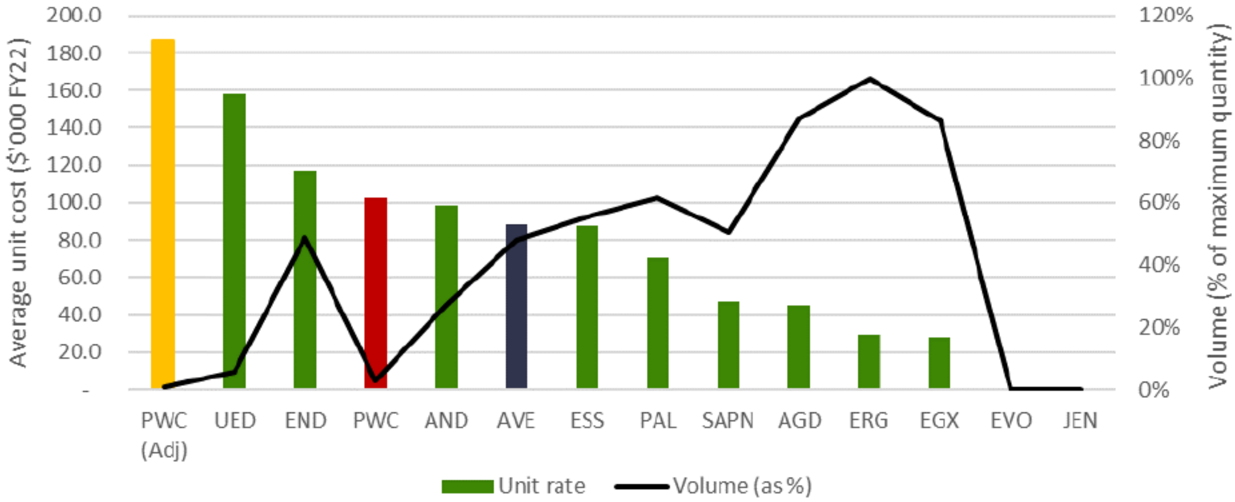

Figure 4 High voltage (HV) conductor

C.7 LV Cables

LV cables are fairly standard across DNSPs and shows a moderate correlation (-22%) between volumes and unit rate, indicating some level of economies of scale.

We note that the historical unit cost for PWC is slightly below the average unit rate by approximately 15% and consistent with the majority of other peer businesses. The data for EvoEnergy was an outlier and was excluded from the analysis of this asset class.

However, when adjusted due to more detailed analysis of each of the line items, the unit cost has increased. On closer analysis, the unit cost for LV Cable is significantly dependent on:

- Access issues;
- Below ground conditions, including other services and rock content in the soil; and
- Whether cables are installed in ducts or direct buried, open trenched or directional drilled.

The RIN data does not provide the additional details that contribute to additional costs, and which would allow normalisation of these costs.

As for the HV and LV conductor unit costs, the LV cable unit cost is comprised of approximately 80% labour and would be subject to similar cost drivers associated with working in the Northern Territory.

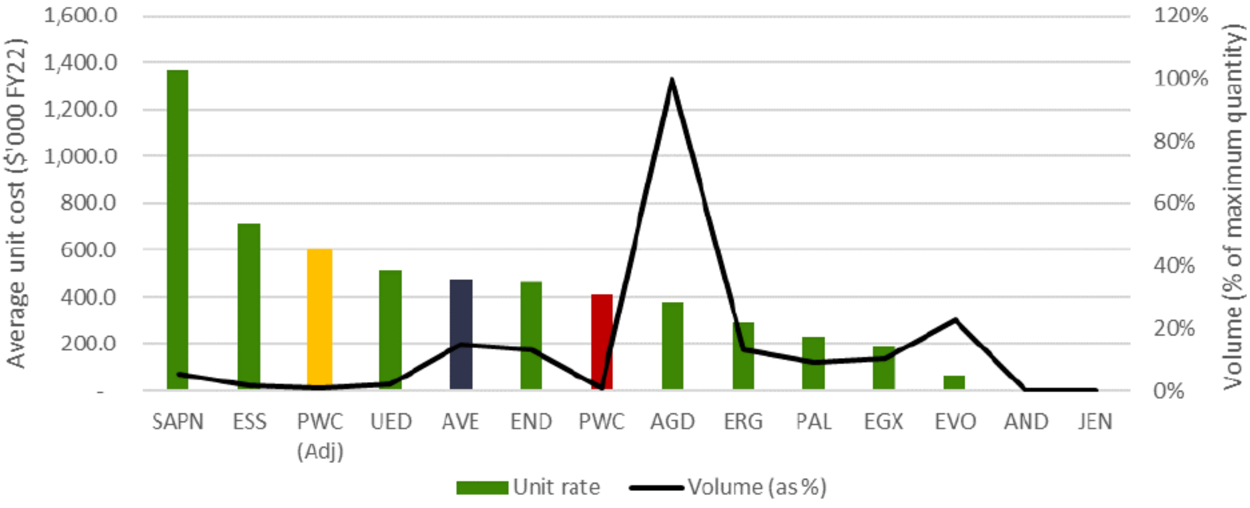

Figure 5 Low voltage (LV) cables

C.8 HV Cables

HV cables are fairly standard across DNSPs and shows a moderate correlation (-42%) between volumes and unit rate, indicating some level of economies of scale.

The historical unit cost for PWC is slightly below the average unit cost by approximately 15% and consistent with the majority of other peer businesses. The data for EvoEnergy was an outlier and was excluded from the analysis of this asset class.

However, when adjusted due to more detailed analysis of each of the line items, the unit cost has increased. On closer analysis, the unit cost for HV Cable is significantly dependent on the same range of factors as the LV Cable unit cost.

Similarly, this information is not available from the RIN.

Also the HV Cable unit cost is comprised of approximately 75% labour and would be subject to similar cost drivers associated with working in the Northern Territory.

The unit cost does benefit from some economies of scale reflective of the relatively higher rate of HV cable replacement being undertaken in the northern suburbs of Darwin.

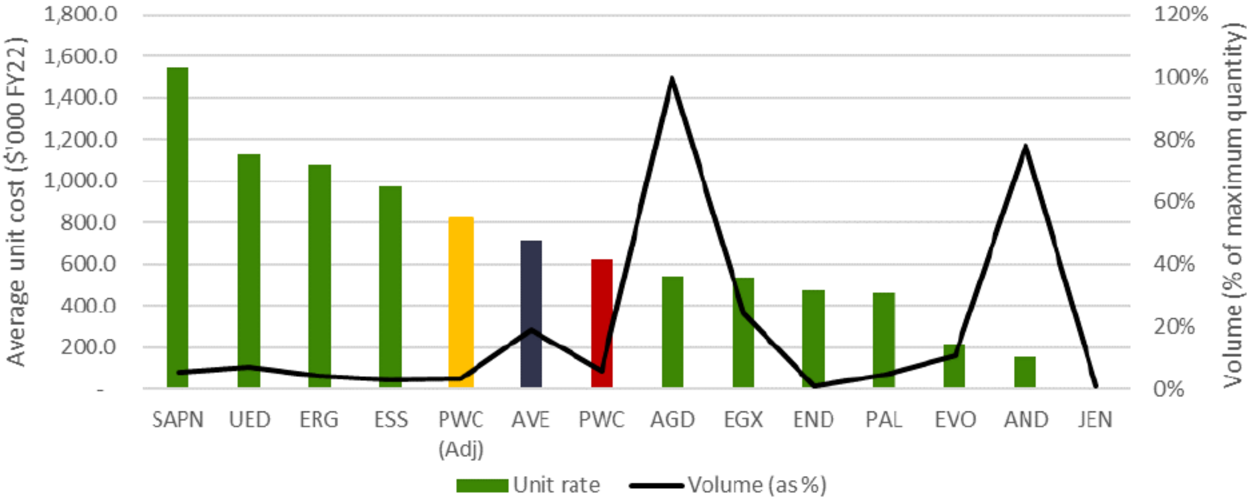

Figure 6 High voltage (HV) cables

C.9 Services

Service replacement programs are common to many DNSPs, with many DNSPs having realised reductions to the service replacement unit costs as each of the programs matured and became business as usual. Power and Water is commencing a new services replacement program with significantly lower volumes than undertaken by other DNSPs.

The data indicates a strong correlation between the volumes and unit rate of -64%, demonstrating that there is likely to be a degree of economies of scale achievable. However, Power and Water doesn't have a high volume of assets (or planned volume of asset replacement), or numbers of field crews to gain from the economies of scale discussed earlier.

Additional costs are also incurred when related assets, and not just the service itself, are identified as being unsafe and require immediate replacement. After the first cycle of replacement through the network, the volume of associated assets requiring replacement is expected to reduce with a corresponding reduction to the unit cost.

The unit cost is comprised of approximately 80% labour, and like other assets would be subject to similar cost drivers associated with working in the Northern Territory.

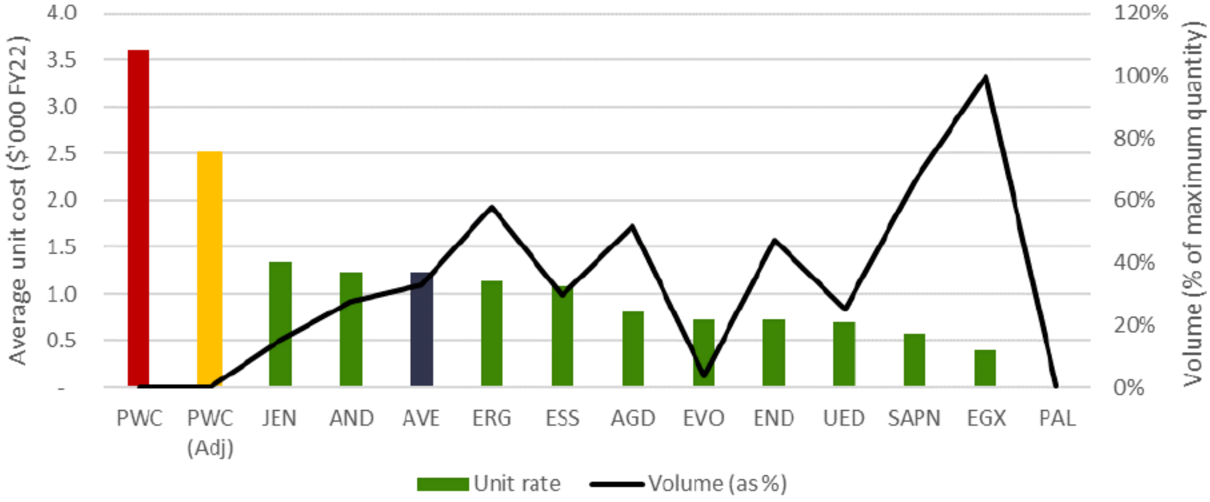

Figure 7 Services

C.10 Switchgear

Distribution Switchgear

The type of assets that can be included in the distribution switchgear RIN categories can vary significantly across networks and impact the unit costs calculated based on the RINs. Differences can include:

- air-break or gas switches.
- ground mounted RMUs.
- the degree of remote control and reclose capability.
- current, voltage and enclosure (IPxx) ratings.

This information is not available from the RIN to assist more detailed analysis.

However, the data indicates a strong correlation between the volumes and unit rate of -62%, demonstrating that there is likely to be a degree of economies of scale achievable. However, Power and Water has not had a significant switchgear replacement program, and therefore lower replacement volumes are not able to realise the economies of scale.

The historical unit cost for Power and Water and PWC (Adj) are similar and both are above the average unit cost. These are both higher than the average, and which is comprised of approximately 70% labour.

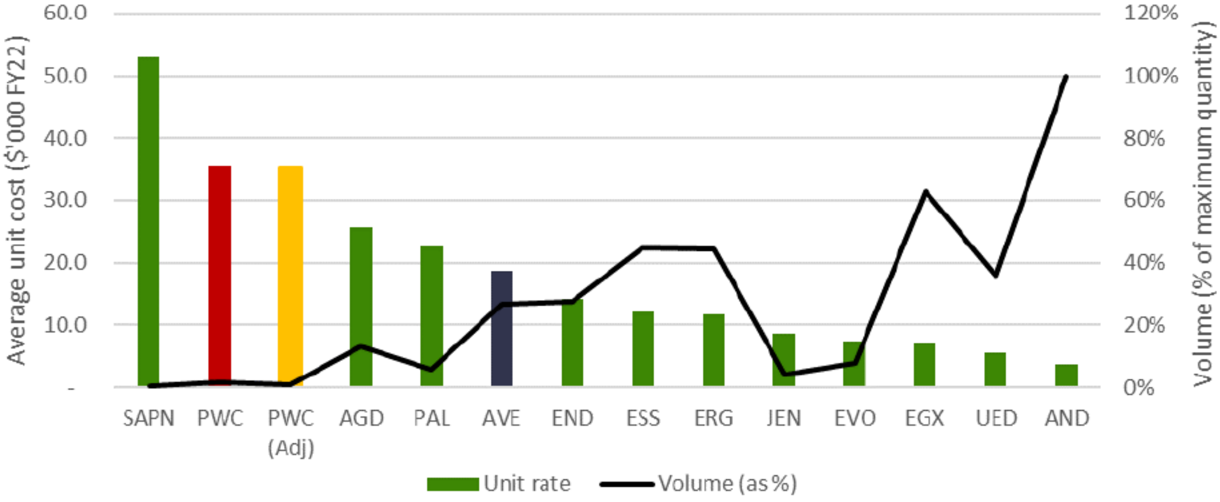

Figure 8 Distribution switchgear

ZSS Switchgear

Since costs are recorded to a project as incurred, they are reported in the RIN as incurred each year. For major projects such as zone substation assets, the asset is only recorded in the system once commissioned. Hence, there can be cost recorded in the historical RIN against this asset category without an associated asset repalcement. This has the affect of inflating the historical unit cost and is shown in the PWC data.

Once adjusted to remove the costs without associated quantities so that it is more reflective of the actual unit cost, the PWC (Adj) reduces below the average unit cost. As shown, this mismatch of the timing or recording of costs versus recording of asset replacement quantities can have a significant impact on the apparent unit cost. It is not known whether a similar mismatch may be present in other DNSP data, however with increased replacement volumes the distortionary affect is likely to be mitigated. For example, the high replacement volume and low unit cost associated with Powercor suggests a similar mismatch may exists.

There is also variability in how DNSPs allocate assets between circuit breakers (ZSS based) and switches (distribution network based) between the asset categories, with the corresponding asset replacement volumes impacting the unit cost and therefore the comparison.

The correlation between volumes and unit costs is high at -55%, however, given the data issues suggest that this is unlikely to be a reliable indicator.

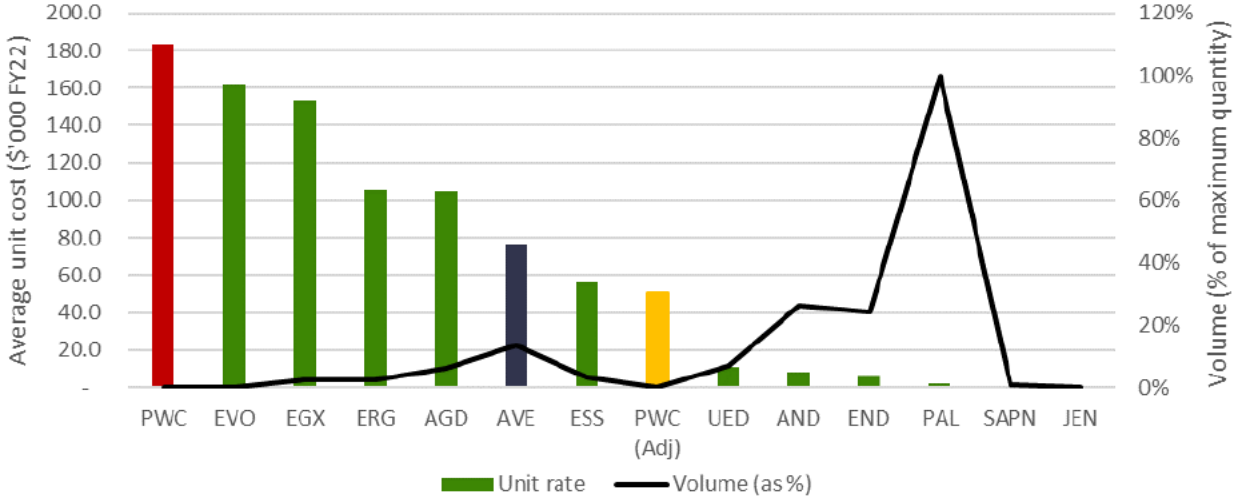

Figure 9 Zone substation switchgear

C.11 Distribution Transformers

The type of assets that can be included in the distribution substation RIN categories can vary significantly across networks and impact the unit costs calculated based on the RINs. Differences can include:

- mounting type (pole, kiosk or ground)
- associated switches and fuses
- the degree of remote control and reclose capability
- jurisdictional design requirements and standards
- current, voltage, capacity (kVA) and enclosure (IPxx) ratings

The benchmarking charts for the three mounting types are shown below. The data does show a strong correlation between the volumes for Pole and kiosk types, but not for ground mounted types, this indicates a lower degree of economies of scale that may be achievable.

We note that the for all three asset types, both PWC (calculated on the same basis as the peer businesses) and PWC (Adj) indicate comparable unit costs are similar to peer DNSPs..

These factors above make a high level benchmarking analysis less certain as the RIN data does not provide the additional details that create additional costs. Further, the unit rate for Power Water is comprised of approximately 70% labour. Hence, the unit rate for PWC (Adj) also includes the incrementally higher labour costs associated with outdoor work in the environmental conditions unique to the Northern Territory.

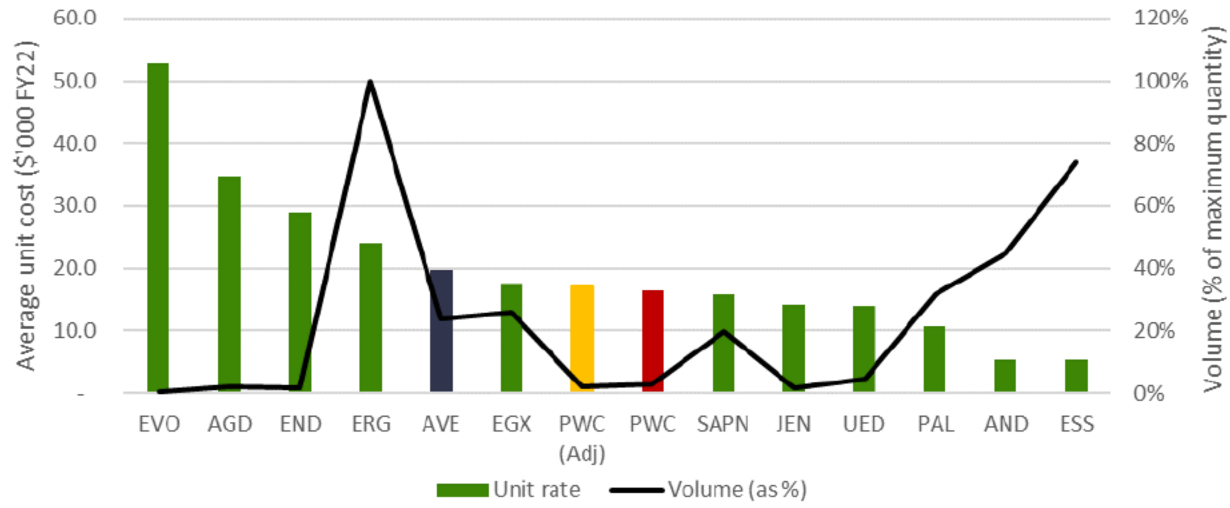

Figure 10 Pole mounted distribution substation

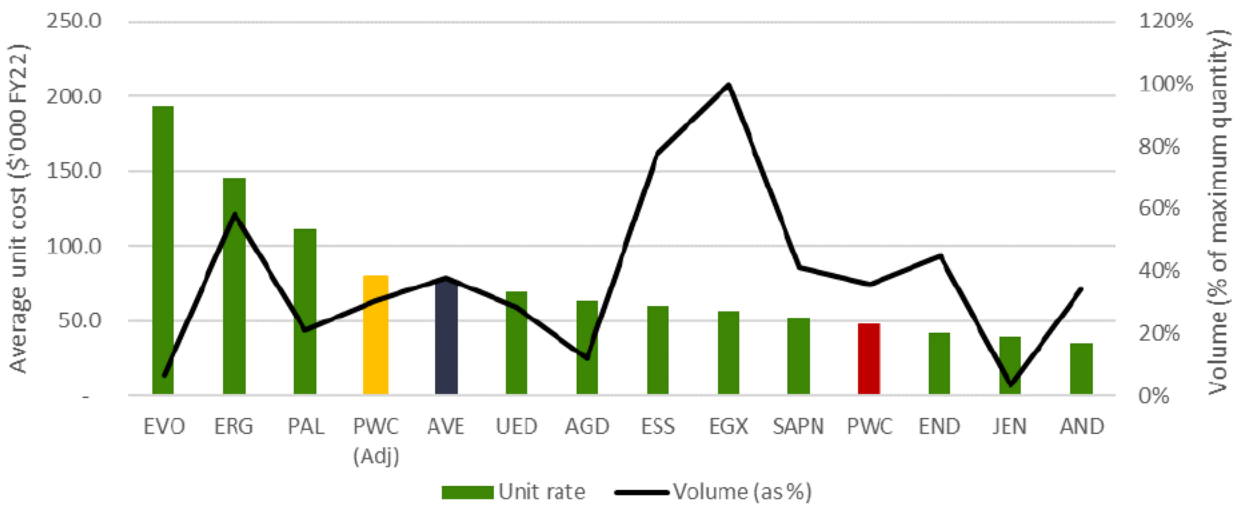

Figure 11 Kiosk mounted distribution substation

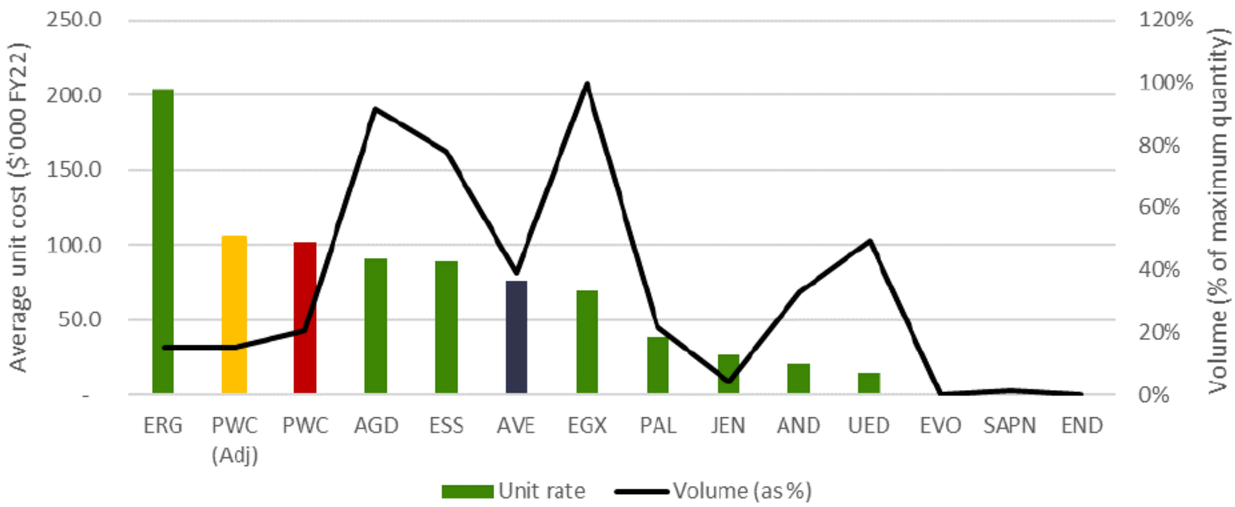

Figure 12 Ground mounted distribution substation

Appendix D. Basis for cost estimates by category

The Reset RIN requires reporting of how costs were developed for each project by specified criteria. Table 4 lists the criteria and where the method is described in this document.

Additional tables describe the methods applied to each project to estimate volumes and costs as described in section 2 and section 3 of this report:

- Table 5 – Replacement projects/programs
- Table 6 – Augmentation projects/programs
- Table 7 – DER projects/programs
- Table 8 – Connections projects/programs
- Table 9 – Non-network projects/programs

Table 4 Reset RIN cost estimation criteria

Criteria	Reference
(a) derived directly from competitive tender processes;	Section 5.4
(b) based upon competitive tender processes for similar projects;	Section 5.4
(c) based upon estimates obtained from contractors or manufacturers;	Section 5.5
(d) based upon independent benchmarks;	Section 5.6
(e) based upon actual historical costs for similar projects; and	Section 2.2
(f) reflective of any amounts for risk, uncertainty or other unspecified contingency factors, and if so, how these amounts were calculated and deemed reasonable and prudent.	Section 5.3

Table 5 Cost estimation methodology – Replacement projects/programs

Code	Project name	Estimation method	Cost methodology
NMFCR	All regions condition and failure based replacement program	Program of works	Based upon actual historical costs for similar projects.
NMP1	Darwin Northern Suburbs High Voltage Cable Replacement Programme	Program of works	Based upon actual historical costs for similar projects.
NPR1	Condition, obsolescence and functionality based replacement programme	Specified projects	Based upon a combination of: • actual historical costs for similar projects

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			• estimates obtained from contractors or manufacturers
NMP22	Alice Springs - replacement of corroded poles (PRA34420)	Program of works	Based upon estimates obtained from contractors or manufacturers. Verified based upon actual historical costs for similar projects.
PGM005	Services replacement programme	Program of works	Based upon actual historical costs for similar projects.
NMSC1	MPLS Migration	Program of works	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers
NMP7	Distribution switchgear condition based replacement	Specified projects	Based upon actual historical costs for similar projects.
NMP2	Darwin Cullen Bay and Bayview Low Voltage Cable Replacement	Program of works	Based upon actual historical costs for similar projects.
NMA	ZSS minor capital asset replacement program	Program of works	Based upon actual historical costs for similar projects.
NMP5	Darwin Lake Bennett Conductor Clearance Rectification Programme	Program of works	Based upon actual historical costs for similar projects.
NMP17	Single Phase Substation Refurbishment Program	Program of works	Based upon actual historical costs for similar projects.
NMP20	Transmission Line Pole Top Corrosion Replacement Program	Program of works	Based upon actual historical costs for similar projects.
PGM004	Distribution pillars replacement	Program of works	Based upon actual historical costs for similar projects.
PGM006c	Misc comms project - SD-LG fibre upgrade	Specified projects	Based upon actual historical costs for similar projects.
PGM002	EMS software replacement	Specified projects	Based upon estimates obtained from contractors or manufacturers.
NMSC2	Comms Battery Replacement Program	Specified projects	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers

NMSC4	Code Compliance and Safety Program	Program of works	Based upon actual historical costs for similar projects.
NSCa	Access roads	Specified projects	Based upon actual historical costs for similar projects.
PRJ014	Microwave systems replacement	Program of works	Based upon actual historical costs for similar projects.
NMP14	Substation fire protection equipment replacement programme	Program of works	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers
PRJ006	CBD cable tunnel refurbishment	Program of works	Based upon actual historical costs for similar projects.
PGM006d	Misc comms project - Alice Springs to Darwin comms connection (MPLS on Lambda)	Specified projects	Based upon estimates obtained from contractors or manufacturers.
NMP16	Substation DC System Replacement program	Program of works	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers
NMSC3	DWDM retirement	Specified projects	Based upon actual historical costs for similar projects.
NSCb	Communications huts	Specified projects	Based upon estimates obtained from contractors or manufacturers.
PGM006a	Misc comms project - Antenna monitoring program	Specified projects	Based upon actual historical costs for similar projects.
PGM006b	Misc comms project - FD service replacement	Specified projects	Based upon actual historical costs for similar projects.

Table 6 Cost estimation methodology –Augmentation projects/programs

Code	Project name	Estimation method	Cost methodology
NMP21	Transmission line upratings	Program of works	Based upon actual historical costs for similar projects.
NPQ	Power quality compliance program	Program of works	Based upon actual historical costs for similar projects.
NOL	Overloaded Feeders / Distribution Augmentation Program	Program of works	Based upon actual historical costs for similar projects.

PRJ009	Install ZSS Reactors	Specified projects	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers
NDP	Design and planning projects	Program of works	Based upon actual historical costs for similar projects.
NMF	Feeder upgrade programme	Program of works	Based upon actual historical costs for similar projects.
CGT07	Locks and security (renamed Protective Security)	Program of works	Based upon actual historical costs for similar projects.
PRGxxx	Transmission tower physical protection - Tiger Brennan Drive	Program of works	Based upon actual historical costs for similar projects.
NLC	Low clearance or easement compliance	Program of works	Based upon actual historical costs for similar projects.

Table 7 Cost estimation methodology –DER projects/programs

Code	Project name	Estimation method	Cost methodology
TBA	DOE – hosting capacity	Specified projects	Based upon a combination of • estimates obtained from contractors or manufacturers • independent benchmarks

Table 8 Cost estimation methodology – Connection projects/programs

Code	Project name	Estimation method	Cost methodology
All	Various	Program of works	Based upon actual historical costs for similar projects.

Table 9 Cost estimation methodology –Non-network projects/programs

Code	Project name	Estimation method	Cost methodology
All	Property	Specified projects	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers

All	Fleet	Specified projects	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or manufacturers
All	ICT	Specified projects	Based upon a combination of: • actual historical costs for similar projects • estimates obtained from contractors or vendors (including cloud-based services)

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