



AusNet Electricity Services Pty Ltd

Electricity Distribution Price Review 2016–20

Appendix 7D: Project Cost Estimating Methodology

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Project Cost Estimating Methodology

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1 Introduction

The purpose of this document is to describe the principles, methodologies and procedures AusNet Services follow to prepare cost estimates for major capital projects developed for the Electricity Distribution Price Reset (EDPR) submission for regulatory period 2016 – 2020.

1.1 Background

AusNet Services follows a standardised approach to developing, managing & reporting projects and programs of works. The Portfolio Framework shown in Figure 1 outlines the four phases, (*Idea, Plan, Build and Close*).

The *Idea* phase encompasses documenting the high level information of a specific project.

The *Plan* phase encompasses the core planning activities that need to be undertaken once a project or program is endorsed and selected into the pipeline. This phase incorporates Business Case Development, approval and completion of detailed designs and control estimates.

The *Build* phase encompasses the activities required to build, construct and implement a project.

The *Close* phase provides a point at which acceptance for the project is confirmed.

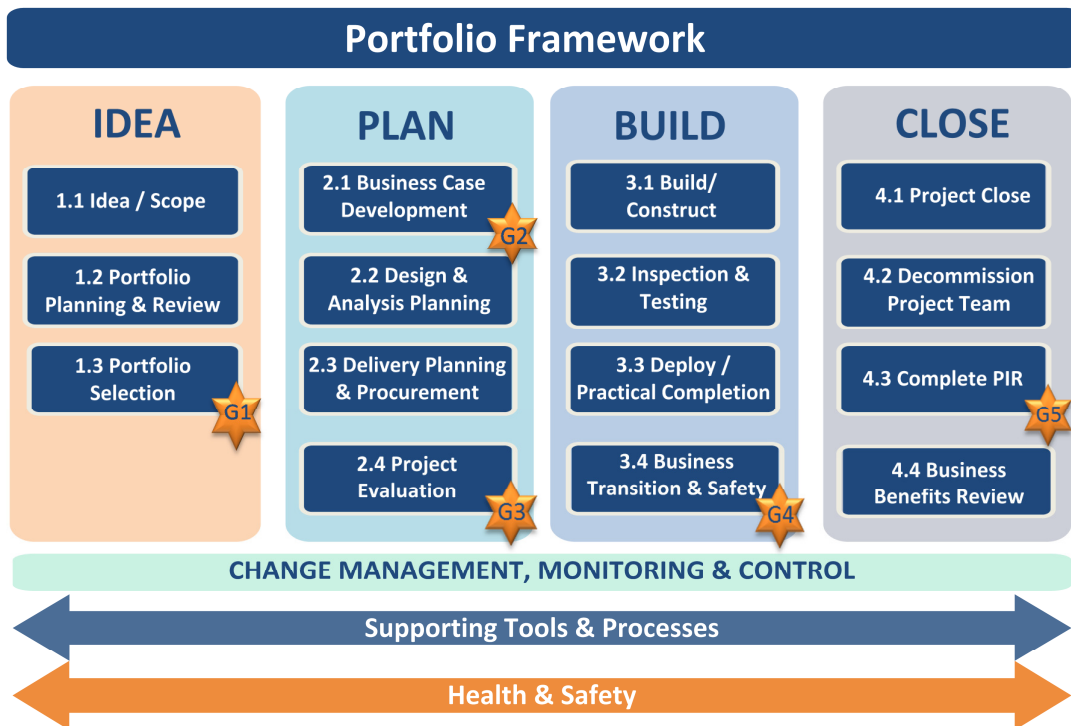


Figure 1 - Overview of portfolio framework.

The Project Development Group within Asset Management (AM) is responsible for providing:

- Project cost estimates for the *Idea Phase* of projects, used for initial cost/benefit analysis, optimisation and prioritisation;

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- Project cost estimates for the *Plan Phase* of projects, used for development and approval of a *Business Case*;
- Project cost analysis for the *Close Phase* of projects to compare the cost estimate with the actual cost for continual development and maintenance of the estimation database; and
- Regular reviews of estimation systems and estimation database in order to facilitate continuous improvement.

The Design Group within Service Delivery (SD) is responsible for providing:

- Project cost estimates called '*Control Estimates*' for the *Plan Phase* of projects, prior to *build phase* to be used along with design release for validation of a *Business Case* and cost control purposes;
- Regular reviews of estimation systems and the estimation database in order to facilitate continuous improvement.

1.2 Scope

The scope of this document predominantly covers the preparation of project estimates during the *Idea* and *Plan* phases of projects.

The scope excludes discussion of other tools currently used to support the project creation, development, execution, monitoring and reporting such as, EPPM¹, NPV² Model, Business Case Documentation/Templates, Oracle, Corporate Risk Framework, and the Project Execution Manual.

¹ Enterprise Program Project Management

² Net Present Value

2 Estimating Outcome

AusNet Services' estimating process is focused on preparation of a *P(90) estimate* which is 'unlikely to be exceeded but not excessively conservative'. The *P(90) estimate* is used for *Business Case* approval. The process of generating a *P(90) estimate* also generates a *P(50) estimate*.

2.1 EDPR Estimates

The project cost estimates used to develop the EDPR capital expenditure forecast are on the basis of *P(50) estimate* outcomes. A *P(50) estimate* outcome does not include the *Management Reserve* derived for a project.

A project's *Management Reserve* allowance is used to cover "uncertainty" in the project and is released to the project manager through a change management process.

2.2 Estimating Principles

AusNet Services' estimates are founded on five key principles, they are:

1. All projects are to be project managed in accordance with the AusNet Services project execution procedures & practices
2. For *Business Case* approval and implementation, *P(90) estimates* provide confidence in processes of project priority, affordability and strategic fit

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3. Estimates are subject to reviews and a sign-off process based on consistent clear lines of responsibility and accountability that will ensure costing standards and controls are applied to any budget information that is to be released
4. Regular system reviews are conducted to encourage and facilitate continuous improvements
5. Project learnings will be shared to increase corporate knowledge.

2.3 Estimating Rationale

AusNet Services recognises that cost management, including cost estimating, must be exercised in the broader context of project management. Estimating is an integral part of a system of interdependent core inputs of scope, time, cost, quality and uncertainty. The project budget results from approval of the business case equivalent estimate at the beginning of the *Plan Phase*. The *Project Estimate (Uncertainty adjusted Planning Estimate)*, which is based on a sound definition of the scope of the preferred option from the options analysis, is of critical importance in the economic justification (cost/benefit) of the project.

The projects developed for and information provided in the EDPR submission are based on AusNet Services' need to address asset condition, safety, and regulatory obligations in its distribution network. Identification and funding of the highest priority works to meet these needs, and delivering them through an efficient program, is underpinned by sound project cost estimation.

Estimating in the current market environment requires a conservative but realistic view of the project scope together with the associated *Project Components* and *Project External Uncertainties*, particularly in the early project stages when detailed design is yet to be produced. Estimators must make provision for items that are considered likely to be required, having regard to such inputs as environmental determinants and community input on the final project scope. Such items are included as *Provisional Items* and not through an increase in *Management Reserve*.

The challenge for the estimator is to arrive at a realistic (that is, not overly conservative) view of the project scope and associated *Project Uncertainties*, and assign appropriate quantities for *Project Uncertainties* and *Management Reserve* in order to produce a meaningful estimate within the *P(90)*. All estimates must include a detailed consideration of project costs, including project definition, engineering and management. These costs may be estimated using typical values or estimated on a first principles basis, taking into account the expected personnel required for the project and their costs. Estimates are applicable only to a particular project scope, or range of scopes or program of works, which are defined as part of the estimating process.

Each estimate is presented in a standard *Business Case* format, and incorporates a report that defines the scope, uncertainty and assumptions on which the estimate has been based.

3 Estimating Processes

To assist with the development of projects/programs an *Options Analysis and Indicative Estimate* and / or *Planning Estimates (Uncertainty adjusted Planning Estimate)* is prepared. The Project Development group, in collaboration with other key stakeholders internal and external to the business, develops scopes of work to enable estimation of projects for option selection, regulatory submission and *Business Case* approval.

3.1 Options Analysis and Indicative Estimate

An *Options Analysis and Indicative Estimate* is prepared to assist in developing a project from the conceptual scope provided by the project initiator. Often the information in the conceptual scope is preliminary and high level in nature with broad functional requirements. The indicative

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estimation process provides approximate costs for determination of project feasibility, options analysis and selection. This type of estimate is used in economic evaluations.

The estimating process requires consultation with various stakeholders to determine the best approach to achieving the functional requirements in the most effective manner.

An *Indicative Estimate* is often undertaken as a desktop estimate with allowances allocated to loosely defined scope items and appropriate quantities of *Project Uncertainties* allocated for unknowns.

Inputs:

- Conceptual Scope (Mandatory)
- Risk assessment (Mandatory)
- Single line diagram (Preferred)
- Implementation methodology (Desirable if available)
- *Project schedule* (Desirable if available)

Outputs:

- *Scope of Works & Indicative Estimate* based on the standard MS Word template generally including multiple options with estimated (top down) costs to determine project feasibility and enable option selection.
- Handover checklist
- Sign-off

3.2 Planning Estimate

A *Planning Estimate* is developed when the project initiator has chosen a preferred solution/option to proceed which now requires further scoping and costing. Information is specific and a conceptual scope may have been produced by the project initiator. The planning estimate process provides further development of options and utilises a top down model to develop costs for options analysis and selection.

The main difference between the *Indicative* and *Planning Estimates* is the certainty of the scope of works from the project initiator, the amount of detail in the scope of work and the provision of build-up and standard pricings rather than allowances.

Once the final option has been chosen by the Project Initiator, the *Planning Estimate* is then adjusted with *Project Uncertainties*. This estimate is used for *Business Case* (financial) approval.

The estimate process requires consultation and facilitation of various stakeholders to determine the best approach to achieving the functional requirements in the most effective manner.

Inputs:

- Conceptual Scope (Mandatory)
- Preferred option chosen (Mandatory)
- Risk assessment (Mandatory)
- Single line diagram (Preferred)
- Implementation methodology (Desirable if available)
- *Project schedule* (Desirable if available)

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Outputs:

- 1) Uncertainty-Adjusted Planning Estimate:
 - *Planning Scope and Uncertainty Adjusted Estimate* based on the standard MS Word template for the preferred option only with project uncertainty adjusted top down costs model to provide information for financial approval of the project
 - Documented Project Risk Register
 - Summary and *IDC* work sheets from the template
 - Handover checklist, and
 - Sign-off

4 Estimating Methodology

4.1 Options Analysis and Indicative Estimates

The development of top-down indicative estimates requires the development of a scope of work including sketches of Single Line Diagrams and an Excel Workbook template based estimate.

The scope of work and estimate is developed as an iterative process which follows the project development process outlined in Appendix A.

The tool used for the estimation of *Indicative estimates* is an Excel Workbook template that aligns with the Scope of Works & Indicative Estimate template.

The Excel Workbook template comprises of multiple worksheets. The individual worksheets can be used as separate 'stages' within a project or completely independent 'options', chosen on the summary sheet. *Overheads* and '*Interest-During-Construction*' (*IDC*) are calculated automatically with the user required to provide a cash flow on the '*IDC* worksheet'.

Excel Workbook resources are updated periodically in conjunction with period order contracts (Materials and Services).

4.2 Planning Estimates

The development of top-down planning estimates requires the development of a scope of work including sketches of Single Line Diagrams, site layout and protection & control schematics. The estimate is prepared using a database tool called Expert Estimator (EE).

The scope of work and estimate is developed as an iterative process which follows the project development process outlined in Appendix A.

The tool used for the estimation of the *Planning estimate* is a Database Workbook template that aligns with the Planning Scope & Uncertainty Adjusted Estimate template.

Expert Estimator is a database consisting of resources such as labour, materials, mobile plant and group resources. The database is built up from first principles in accordance with the current standards and drawings. In addition the estimate build up consists of resources with appropriate cost codes/Work Breakdown Structure (WBS).

Numerous Output reports can be created ranging from a project summary to individual components; these reports can be imported into Excel formats to produce business case costing formats.

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Expert Estimator resources (Materials and Services) are updated periodically in conjunction with period order contracts.

4.2.1 Top-Down Distribution Estimating Template – Options Analysis and Indicative Estimate

As mentioned in section 4.1 the Excel workbook is used for two purposes Options Analysis and Indicative Estimate. The Excel workbook template is stored on a network drive.

The Excel Workbook template includes the provision of 'standard bays' and equipment units generally in use across the AusNet Services Distribution System. The standard bays include all typical costs associated with the installation of a bay. Alternatively, the bays can be built up with the individual components using the drop down options.

The process involved in creating this type of estimate is to extract the latest workbook, compile the project, and document management details. In the workbook there are a number of sheets which each contain standardised group work tasks. These standardised group works tasks are selected based on the scope of works.

The group work tasks are built up from period order contracts with suppliers and plant and labour cost based on services contracts.

Project indirect labour costs for the lifecycle of the project, including Project Management, design management, site management and Health, safety and environment management, are determined as a percentage of the total direct costs of the project based on historical outturn costs of delivering similar projects.

Project indirect labour costs include:

- 1) Project development costs up to approval of Business Case.
- 2) Cost of project management, supervision and procurement services through the *Plan, Build and Close Phase* of the project.
- 3) Cost of engineering support during delivery.
- 4) Cost of project close-out.

Design costs are determined as a percentage of the total direct costs of the project based on historical quotations or outturn costs of similar projects.

The *Contractor Indirect Costs* are determined as a percentage of the total direct costs of the project based on historical quotations or outturn costs of similar projects.

These costs include the non-direct labour and materials cost of the *Installation Service Provider (ISP)* such as:

- 1) Inductions
- 2) Site and shift allowances
- 3) Travel time or allowances
- 4) Living Away from Home Costs (accommodation, meals, etc.)
- 5) Contractor project management and supervision costs
- 6) Contractor Occupation Health & Safety and quality control costs
- 7) Contractor procurement and administration costs
- 8) Contractor support equipment including computers, faxes, phones, refrigerators, potable water, etc. for the contractor to perform their work on site
- 9) Contractor vehicles (plant is allowed in item costs)

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- 10) Contractor site establishment and maintenance costs including huts, site clean-up, etc.
- 11) Contractor provision of huts and amenities for AusNet Services personnel
- 12) Contractor overheads and off-site support costs

A nominal project uncertainties value P(50) between 5 – 10% of the total direct costs including internal AusNet Services costs, design and sub-contractor indirect is generally added at the options analysis stage of the process. Refer to Figure 1 for more details.

This item is refined once the *quantitative assessment of project uncertainties* is undertaken and the outcomes of *Project Uncertainty* and *Management Reserve* are derived through *Monte Carlo simulation*.

4.2.2 Top-Down Distribution Estimating Template – Planning Estimate

Planning Estimates are developed using the Expert Estimator tool. The Expert Estimator database is stored on a network drive. The Project Development Engineer compiles the estimate by entering the quantities for the relevant group work resource into the database.

Project labour costs are developed using a bottom-up approach based on individual project team roles and duration of the project.

Design costs are determined as total direct costs of the project based on outturn costs of similar projects.

Contract indirect costs are developed based on the project schedule using a bottom-up approach.

Once the estimate is completed, the individual work group items are exported into an Excel based workbook template, this enables the data to be presented in the form suitable for business case approval.

Project P(50) and P(90) uncertainty values are developed by compiling the *Project Components Uncertainty* and *Project External Uncertainty* then using @Risk® Simulation (See Section 4.2.3) to compute these values.

4.2.3 Project Uncertainty and @Risk® Simulation

The *Quantitative Assessment of Project Uncertainty* and the *@Risk® Simulation* is also incorporated and applied in the Workbook Template (Combined Risk Adjusted Estimate – Template). The process of *Quantitative Assessment of Project Uncertainty* is detailed in Section 5.2 below.

5 Assessment of Project Uncertainties

AusNet Services applies an uncertainty based approach toward estimating through the implementation of a *Qualitative and Quantitative assessment of project uncertainty* framework. The framework involves collaboration of AusNet Services stakeholders to assess project uncertainties from the project *Idea* to *Close* phases. The Project Development Team facilitates the *Plan* phases of the framework and administers the *Quantitative Assessment of Project Uncertainties*.

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5.1 Qualitative Assessment of Project Uncertainties

The first step in quantifying the cost impact is to assess the *Project Uncertainties* and uncertainty management measures that exist on each individual project or program of work. This is called the *Qualitative assessment of project uncertainties*. This is performed by the Project Initiator after the development of the conceptual functional scope is complete. The *Qualitative assessment of project uncertainties* is documented using the standard format of the *project uncertainty register* template and uses the uncertainty assessment tables in the Project Uncertainty Management Framework.

The first stage involves the uncertainty identification, its causes and the possible impacts. Next is the treatment of uncertainties based on an assessment of the current controls in place to minimise or to eliminate uncertainties. From this, the Uncertainty Control Effectiveness is ascertained and any future treatment actions to be implemented are identified. Using the standard Uncertainty Matrix of Consequence and Likelihood, the Residual Uncertainty Rating is determined and a cost applied for the project financial exposure.

Following the *Qualitative Assessment of Project Uncertainty*, the outputs of this uncertainty assessment become the inputs into the process of *Quantitative assessment of project uncertainties*.

5.2 Quantitative Assessment of Project Uncertainties

The objective of the *Quantitative assessment of project uncertainties* is to primarily identify the *Project Components Uncertainties* and *Project Specific External Uncertainties* and then estimate the variability that occurs in a project.

The *Project Components Uncertainty* is a variability that arises from planned or known uncertainties and opportunities which represent the uncertainty in the cost of the known scope of work. *Project Components Uncertainties* occur especially when assumptions have been made in regard to the scope, i.e. the size or type of material required for the project.

The *Project External Uncertainty* is a variability that arises from external events that typically occur during the life of the project that may differ from what has been assumed in the reference estimate.

Figure 1 shows the process of typical cost build-up of a capital project cost estimate.

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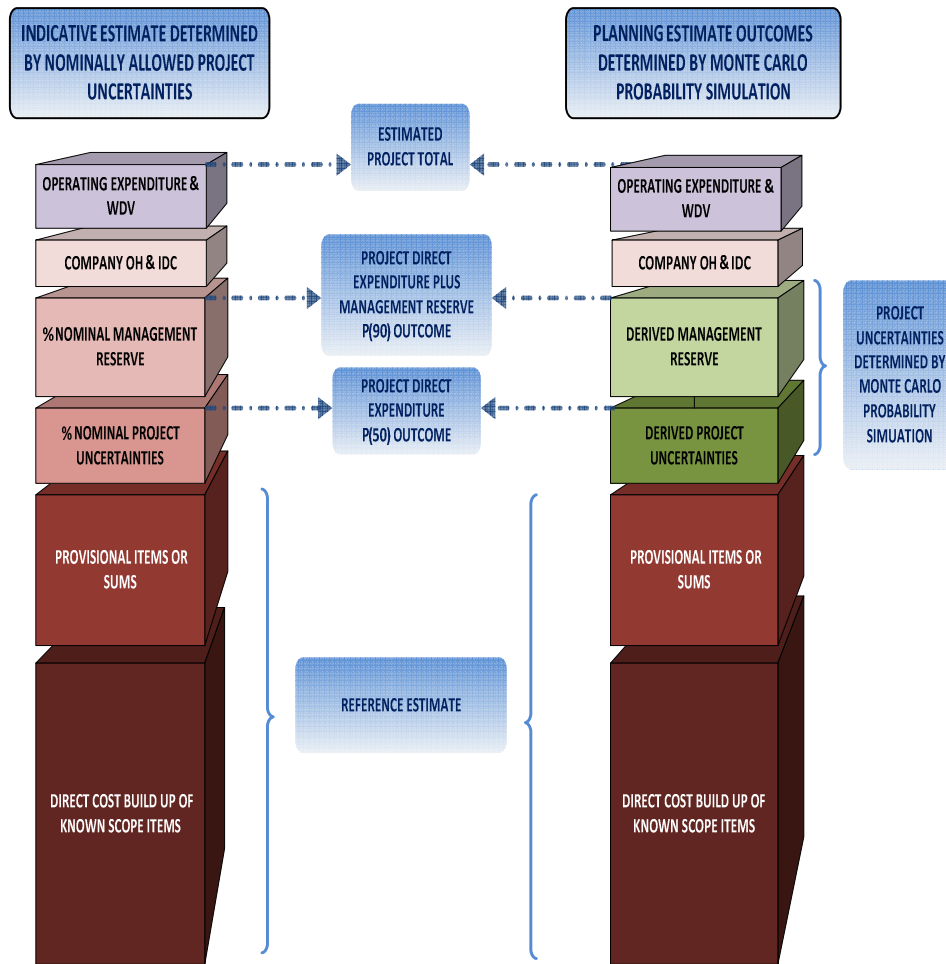


Figure 1 Typical cost build-up process of a capital cost estimate

The inputs to the *Quantitative assessment of project uncertainties* are determined through an estimate review / interrogation performed by the appropriate parties. These parties will include the Project Initiator and relevant stakeholders from Asset Management, Service Delivery, Operations and Field Services.

The *Project Components Uncertainty analysis* is applied to the *Reference Estimate* addressing issues relevant to each individual item or activity within a project. The individual items or lines of the *Reference Estimate* are interrogated and a percentage value is applied against each item or line, based on a distribution (spread) of Minimum, Most Likely and Maximum value of that item/line, based on individual experience and collective knowledge gained from the delivery of previous projects.

The *Project Specific External Uncertainty analysis* is also applied to the *Reference Estimate* and involves the thorough review of the project to identify site specific, generic issues and project specific external environmental issues which potentially could impact on the overall project costs and timings. Using the standard Project External Uncertainty template, the Project

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Uncertainties, their descriptions and the consequences applicable to the *Project Uncertainties* are entered. For each individual *Project Uncertainty* identified, the cost associated with the event should it actually occur, is determined. Documented project uncertainty consequences include the detail of the outcomes and also the basis for how the cost was arrived at. For future project reviews and as a learning function, documented consequences clearly detail the reasoning as to why the cost was applied. After the cost estimate for each occurrence is determined, a percentage for the likelihood of it occurring is reviewed and entered. From this, a distribution (spread) percentage for the Minimum, Most-Likely and Maximum cost impact of this particular event occurring is allocated.

The distributions determined in both the assessment of *Project Components Uncertainty* and *Project Specific External Uncertainty* then become the basis for the *@Risk[®] Simulation*. The *@Risk* simulation performs a *Monte Carlo* probability calculation on the *Reference Estimate* to determine the total *Project Components* and *Project Specific External Uncertainty* costs. The *Monte Carlo* method is a technique that involves using random numbers and probability to iteratively evaluate complex, nonlinear problems. In general, 5,000 iterations are used when running the *@Risk[®] simulation*.

The results of the *@Risk[®] simulation* determine the *P(50)* and *P(90)* outcome values inclusive of *Project Components* and *Project Specific External Uncertainty* costs. The *P(50)* and *P(90)* reflect a 50% and 90% confidence level respectively that the estimate will not be exceeded at the completion of the project. These *P(50)* and *P(90)* values incorporate the following:

Derived Project Uncertainty:

This is the difference between the value of *Reference Estimate* and the *P(50)* outcome arrived from the simulation which is inclusive of *Project Components* and *Project Specific External Uncertainty* costs.

Project Direct Expenditure [P(50)]:

This is the derived *P(50)* total outcome of the simulation.

Project Direct Expenditure plus Management Reserve [P(90)]:

This is the *P(90)* total outcome of the simulation.

Management Reserve:

This is the difference between the *P(90)* and *P(50)* outcomes of the simulation.

6 Review and Approval of Estimates

6.1 Documentation

The documentation used in the review of each type of scope of works and estimate produced is detailed below.

1. *Indicative Estimate*

- Single document detailing basis of estimate, scope of estimate, scope clarifications/assumptions, options and indicative costs
- Estimate summary
- Sign-off

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2. Uncertainty Adjusted Planning Estimate

- Single document detailing basis of estimate, scope of estimate, scope clarifications, and the cost to implement the preferred option. Two figures are supplied, the *Project Direct Expenditure P(50)* and *Project Direct Expenditure plus Management Reserve P(90)*
- *Project Uncertainty Register*
- *Project schedule*
- Business Case Summary (The *Business Case* splits set out the breakdown of the estimate costs and details how the estimate costs are delivered.)
- The internal finance charge or *IDC* worksheet
- Sign-off

6.2 Scope of Works and Estimate Review and Sign-off

Upon completion of the Scope of works and estimate, a review is performed by the Project Development team members and other relevant parties if required. Depending on the type of project, these can include the Service Delivery Major Projects Team Leader or if assigned, the nominated *Project Manager* and also members of the Engineering Team.

Depending on the type of Scope of works and estimate, the associated documentation and content/integrity of each estimate is reviewed. Any issues identified during the review that require further action are documented and assigned to the relevant person. Upon completion of the technical review and if required comments and/or actions, the final review/sign off is completed by Manager of the Project Development team.

6.3 WBS Structure

The *Work Breakdown Structure (WBS)* is used to define the separate areas or groups within the project. The structure is required to allow the allocation of funds, materials, labour and to facilitate the accurate reporting of project costs. As defined in the *Business Case* split spreadsheet, the groups include but are not limited to:

- Design
- Labour
- Materials
- Plant & equipment
- Contracts
- Meter costs

6.4 Presentation and Handover

Following the scope and estimate review and sign off by Project Development, the *Indicative / Planning scope and estimate* is ready for handover to the Project Initiator.

The *Uncertainly Planning Scope & Estimate* handover check list is completed by the *Project Lead* Engineer prior to the handover. At the handover, project costs are reviewed and all elements of the scope are confirmed. Any amendments or additional works required are documented as action points to be addressed. If there are no further issues or after any other issues have been resolved, the

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Uncertainly Planning Scope & Estimate handover check list is signed, scanned and is ready to be attached into *EPPM*.

Following the handover and sign off of the estimate handover check list, all the relevant documentation is attached into *EPPM*.

7 References

7.1 Sources

A Guide to the Project Management Body of Knowledge

7.2 Glossary of Terms

Acronyms and General Definitions

IDC	Interest During Construction
ISP	Installation Services Provider
AM	Asset Management Group
NPV	Net Present Value
PFT	Project Forecasting Tool
PM	Project Manager
SD	Service Delivery Group
SLD	Single Line Diagram
WBS	Work Breakdown Structure
@RISK®	Excel Bases Simulation Software

Activity: An element of work performed during the course of a project. An activity normally has an expected duration, cost and resource requirement. Activities can be subdivided into tasks.

Actual Cost: The final out-turn dollar expenditure on a project.

Assumptions: Assumptions are factors that, for planning purposes, are considered to be true, real, or certain without proof or demonstration.

Base Planning Object: A Unit Cost for an installed asset assembly and / or functional element.

Bottom-Up Estimation [Process]: A method of estimating a component of work. The work is decomposed into more detail. An estimate is prepared of what is needed to meet the requirements of each of the lower, more detailed pieces of work, and these estimates are then aggregated into a total quantity for the component of work.

Budget: The approved estimate for the project or any work breakdown structure component or any schedule activity. See estimate.

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Business Case [Process]: A Business Case captures the reasoning and Objectives for initiating a project and provides approval to proceed for design and implementation. It is often presented in a well-structured written document.

Contract [Output/Input]: A contract is a mutually binding agreement that obligates the seller to provide the specified product or service or result and obligates the buyer to pay for it.

Contractor Indirect: An allowance that includes the contractor's corporate costs. Indirect costs are those costs that cannot be directly traced to a specific project and therefore will be accumulated and allocated equitably over multiple projects by some approved and documented accounting procedure.

Control Estimate: The budget estimate prepared for the project implementation phase, subsequent to completion of a detailed scope of works and detailed design documentation using a standard Bottom-up Estimating in the Expert Estimation. The control estimate is used to monitor the status of the project to update the project budget and manage changes to the cost baseline.

Cost Budgeting: Allocating the cost estimate to individual project components or WBS.

Cost Codes: Numerical values that identify characteristics of the work or in some way categorise the schedule activities, e.g. 1000 for Project Establishment, 2000 for Project Management. *See also Work Breakdown Structure (WBS).*

Cost Control: Controlling changes to the project budget.

Cost Estimating [Process]: Cost Estimation is the process of developing an approximation of the monetary resources needed to complete project activities.

Deliverable: Any measurable, tangible, verifiable outcome, output, result or item that must be produced to complete a project or part of a project or phase.

Direct Costs: Costs that can be directly attributed to the work being performed or services being received. For construction, it refers to the costs of constructing the physical project activities (resource costs of plant, labour, materials and subcontract).

Estimate (Output/Input): A quantitative assessment of the likely amount or outcome. It is usually preceded by a modifier (i.e. Indicative Estimate, Planning Estimate, and Control Estimate).

Expert Estimation[®]: A resource-based estimating program or software package provided by Vendor Pronamics in the preparation of project estimates used by Project Engineering in AusNet Services.

Indicative Estimate [Process]: A budget estimate developed for a project from initial concepts. Often the information is very vague with only a single line or broad functional requirement. The indicative estimation process provides approximate costs for the determination of project feasibility, options analysis and selection.

Indirect Costs: Costs those are not directly attributable to work items. For a construction project, these costs include on-site overheads. e.g. administration, site supervision, site facilities, off-site overheads costs etc.

Issue: A point or matter in question or in dispute.

Material: The aggregate of things used in projects, such as equipment, gear, consumable material.

Management Reserve: 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

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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.

It is the difference between P(90) and P(50) outcomes.

Methodology: A system of practices, techniques, procedures and rules used by Project Engineering in developing project scope, design and estimate.

Monte Carlo Simulation [Process]: A process which generates hundreds or thousands of probability performance outcomes based on probability distributions for cost and schedule on individual tasks. The outcomes are then used to generate a probability distribution for the project as whole.

Objective: Something toward which work is to be directed, a strategic position to be attained, or a purpose to be achieved, a result to be obtained, a product to be produced, or service to be performed.

P(50) Estimate: An estimate prepared at any stage of a project which has a 50% confidence factor of not being exceeded by cost at completion.

P(90) Estimate: An estimate prepared at any stage of a project which has a 90% confidence factor of not being exceeded by cost at completion.

The P50 Unit Rates: These have been prepared to assist with the development of cost estimates for the Transmission Revenue Reset submission. These rates have been extracted from the AusNet Services top-down estimating model based on typical bay and component costs, adopting certain 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 AusNet Services Specifications and Standards.

Planning Estimate [Process]: A budget estimate prepared during Planning Phase. The Planning Estimation process provides the further development of options considered during Initiation Phase for project options analysis and selection. Once a final option has been chosen the Planning Estimate is risk adjusted and used for financial / Business Case approval.

Project Components Uncertainty [Process]: 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.

Project Components Uncertainties can include but are not restricted to the uncertainty in the scope of work, the uncertainty, or potential variations, in quantities and unit rates proposed in the direct estimate, and variations in construction methods used.

Project Cost Management [Process]: A subset of project management that includes the processes required to ensure that the project is completed within the approved budget. It consists of resource planning, cost estimating, cost budgeting and cost control.

Project Direct Expenditure P(50): This is the estimated P(50) total value. *See P(50) Estimate.*

Project Direct Expenditure Plus Management Reserve P(90): This is the estimated P(90) total value. *See P(90) Estimate.*

Project Cost Estimating Methodology

Project Estimate: The total estimated costs of a project in outturn dollars for all components of a project from the commencement of the initiation phase to the end of the close-out phase.

Project External Uncertainty [Outcome]: Project External Uncertainty is a calculation (or estimate) of the variability that arises from external events that typically occur during the life of the Project. The uncertainty is a portion of the difference between the outturn and what has been assumed in the reference estimate.

The occurrence of an unplanned or unforeseen event such as a natural event or a major safety incident, the change to planned assumptions, stakeholder issues (outage restrictions, community), the availability of resources or materials, delayed access to site, industrial relations issues external to the Project / Program, and contractual issues or claims.

Project Life Cycle: The total duration of a project normally dissected into sequential phases (idea, plan, build and close).

Project Execution Manual: AusNet Services' framework that provides the direction and guidance for effective management and delivery of projects.

Project Uncertainty: Project Uncertainty is the sum of Project Components Uncertainty and Project External Uncertainty.

Provisional Items or Provisional Sums: Items or sums that should be included in an estimate when the designer knows that work is required but cannot quantify it. e.g. planning permit application, rock excavation and soil disposal, exact number of existing drawings to be cancelled without performing a detailed design.

Quantitative Assessment of Project Uncertainty [Process]: The objective of the Quantitative Assessment of Project Uncertainty is to identify both the Project Components and Project Specific External Uncertainties.

Reference Estimate [Outcome]: Direct cost build-up of known scope items including provisional items or provisional sums.

Scope: The sum of the products, services, and results to be provided as a project.

Simulation: A simulation uses a project model that translates the uncertainties specified at a detailed level into their potential impact on objectives that are expressed at the level of the total project. Project simulations use computer models and estimates of uncertainty, usually expressed as a probability distribution of possible costs or durations at a detailed work level, and are typically performed using Monte Carlo analysis.

Uncertainty-Adjusted Planning Estimate: An estimate prepared towards the end of a project's Initiation phase after the options analysis, for the purpose of evaluating the project in the business case. The estimate, which is based on the preferred option of the functional scope, forms the basis of funding approval. It is expressed in present day dollars.

Unit Cost: *See Base Planning Object*

Work Breakdown Structure (WBS) [Output/Input]: A deliverable oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables. It defines and groups a project' discrete work elements in a way that helps organise and define the total scope of work of the project.

See also Cost Code

8 Appendix

8.1 Appendix A

Project Development Process

