Jemena Limited

Jemena Infrastructure Cost Estimation Methodology

JEM PMM-PR-2542

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1. INTRODUCTION

1.1 SCOPE

This document provides the process followed for Jemena Project Cost Estimation for all non-routine projects and programs of work for Jemena Gas Distribution. It details the methodology to be applied when developing a project estimate. Documenting the project estimation process reinforces the importance of applying the framework consistently to achieve the objective of developing accurate project estimates. This document must be read in conjunction with the Jemena Project Management Methodology (PMM).

1.2 PURPOSE AND PRINCIPLES

The purpose of this methodology is to:

- Provide a common understanding of the concepts involved with classifying cost estimates;
- Define and correlate the major characteristics of project cost estimates;
- Use the maturity level of project deliverables as the primary characteristic to categorise cost estimates; and
- Reflect accepted practices in the cost engineering profession.

Jemena's project cost estimates are to be developed to meet the following principles:

1. *Fit-for-purpose* – Estimates are developed to be efficient and to a level of accuracy that ensures they are appropriate for the purpose for which they are to be used. It is acknowledged that the level of accuracy required will vary subject to the purpose for which the estimate is created;
2. *Credible* – the assumptions used in the development of the estimate are to be realistic. They have been cross-checked and reconciled. They are to match the level of confidence associated with the estimate;
3. *Documented* – supporting documentation shall include a narrative explaining the process, sources, and methods used to create the estimate and identifies the underlying data and assumptions used to develop the estimate; and
4. *Reviewed and Approved* – estimates are subject to a review and approval process to ensure accountability, responsibility, costing standards and control applied prior to release.

1.3 BACKGROUND

Jemena undertakes construction, operations and maintenance work on a variety of electrical and gas infrastructure assets around Australia. Many of these activities are delivered as a project or as a program of works through an annual program of work detailed from the rolling two year Capital and Operating Works Plans (COWP). Jemena's Project Management Methodology (PMM) mandates the requirement for a Financial Investment Decision (FID) to enable Projects and Programs of works to transition through the lifecycle gating process. At the time of FID, the level of uncertainty in the project estimate needs to be commensurate with the business/commercial risk of the project.

Accurate budgeting is dependent on the consistent application of a robust cost and schedule estimating methodology. The Project Cost Estimation process described in this document aims to provide consistent accurate project and program estimates by ensuring that:

- all relevant inputs are considered – encompassing scope definition, asset management standards requirements; HSE requirements, site information; standard rates; and vendor pricing;
- project cost estimates reflect the detailed design and delivery strategy, including construction, procurement and resourcing; and
- risk is treated appropriately, recognising that Jemena undertakes a portfolio of projects and programs of work, and that an element of risk should be applied at the portfolio level.

1.4 OVERARCHING GOVERNANCE PROCESS

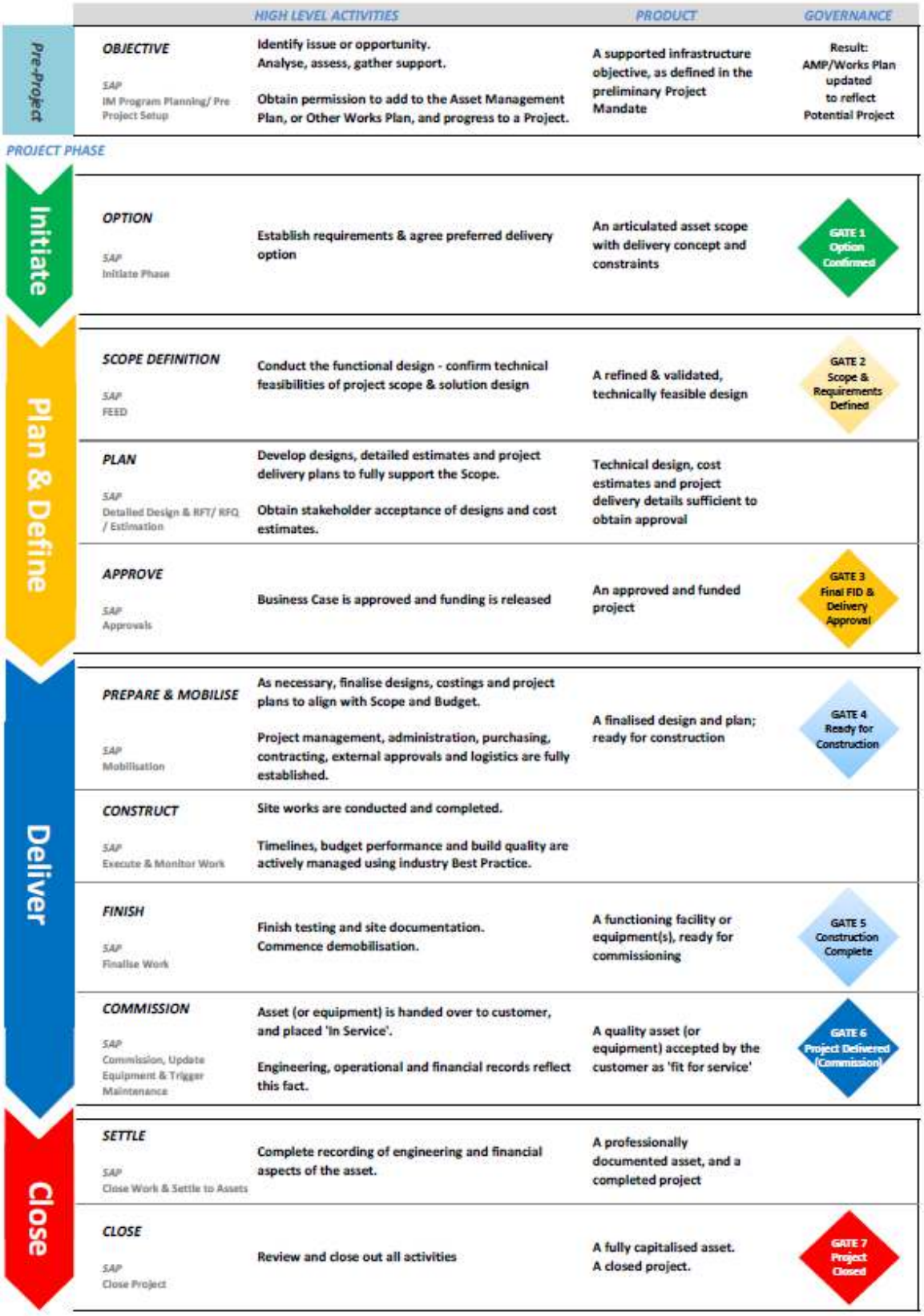
The cost estimation framework is part of Jemena's broader governance process and targets the realisation of 'value for money' for all stakeholders by trying to determine the efficient project cost to deliver the scope of works. This process includes a number of tools that help us ensure that we achieve efficient investments. The key elements in our governance process are briefly summarised below:

- Asset Business Strategy (ABS) covers a 20 year time horizon and ensures Jemena adapts over time to maintain the relevance of our services to our customers.
- Asset Investment Plan (AIP) covers a seven year time horizon and summarises Jemena's rolling five-year forecast of the capital work we need to undertake to maintain a safe, reliable network, and is updated annually.
- Capital and Operating Works Plan (COWP) covers a two year time horizon and is derived from the Asset Investment Plan (AIP).
- Project Management Methodology (PMM) provides a framework which improves and standardises scoping, estimation and delivery management of network infrastructure programs. PMM details the project governance gating process for managing projects from inception through to completion; the framework also ensures alignment to Jemena's Delegation of Financial Authority (DFA) policy. Portfolio and Planning Governance Process governs the prioritisation of projects within the COWP and monitors issues, risks, variation and escalation across the portfolio. Portfolio and Planning gathers information from all projects (large and small) to sequence the projects (based on dependencies, resource constraints, and priorities) in a way that ensures an optimised portfolio at a given point in time.

Figure 1–1: PMM Lifecycle and Gating Process below illustrates the PMM project gating process.

In terms of the project gating process illustrated above, this document describes the arrangements in place to ensure that project cost and unit rate estimates entering Gate 3 are robust and substantiated. In addition, the document also explains that works planned beyond a two-year time horizon are subject to ''Top Down'' estimates.

Figure 1–1: PMM Lifecycle and Gating Process



2. ESTIMATING TECHNIQUES AND DEPENDENCIES

This section provides an overview of Jemena's approach to developing estimates for projects and programs of work.

Jemena's cost estimating approach draws on the best available information, given the nature and proposed timing of the expenditure. Both, 'Top Down' and/or 'Bottom Up' estimating methods are used to ensure that a project estimate is fit for purpose in the context of both the PMM project governance gating process and the two-year rolling program as defined by the COWP.

Wherever possible the project/program shall be estimated from a 'Bottom Up' build, as sufficient detail to enable an accurate overall project cost (i.e. within ± 10%). Sufficient detail may include (but not limited to) detailed scope of works, preliminary design, detail design, site assessments, consultation, procurement and construction/delivery methodology.

Project estimates are generally completed in nominal dollars, without any consideration of potential future price changes (i.e. for the change in price of capital inputs, wages, CPI etc).

2.1 'TOP-DOWN' ESTIMATING TECHNIQUE

The 'Top Down' estimating technique is used by approximating the size (duration and cost) and risk of a project/program (or phase) by looking at the project/program as a whole and comparing it to previously performed similar projects. The comparison may be made directly using 'Analogous estimating', through an algorithm as in 'Parametric estimating', or from 'Expert Judgment'.

For non-routine projects, this approach can be used for budgetary estimates for outer year estimates (beyond a two (2) year investment horizon). 'Top-Down' techniques are able to produce reasonable estimates with limited inputs, recognising that detailed scopes of work have not been developed at this point in time. The Top-Down technique is used in the majority of Access Arrangement estimates because the project timing is generally in the outer years and not all scope items or risks can be identified or anticipated, particularly before a project begins.

The 'Top-Down' estimates are created using 'modules' which are sourced from:

- historical data from past projects/programs (e.g. unit and material rates);
- recent tender prices (at the time of estimating, generally within one (1) year);
- expected labour costs (consistent with Jemena's labour model); and
- period contract schedule of rate prices.

Once a project estimate is developed from the individual modules, a review is undertaken for any potential synergies and/or unique project conditions. These details are then documented in the project estimate.

2.1.1 ADVANTAGES OF TOP-DOWN ESTIMATING

An advantage of implementing a top-down estimation methodology is that it can result in a rapidly generated estimate. The development of top-down estimates can be done without the deep involvement of those responsible for end delivery. These estimates can be "sized" and socialised within the approving levels of Jemena to determine the acceptability of the top-down estimate to expectations for delivery of the project scope.

2.1.2 DISADVANTAGES OF TOP-DOWN ESTIMATING

A large dependency of top-down estimating is the high level scope and assumptions used to feed the estimating. If the scope and assumptions are not carefully thought through it can lead to unrealistic estimates, which create unachievable expectations. Additionally, there may be a disconnect between the top-down estimator's knowledge of the effort required for delivery of the estimate element being estimated, which generally can lead to under-estimation.

Accordingly, top-down estimates and bottom-up estimates play a complimentary role and Jemena's estimation framework seeks to utilise both estimating approaches. A good top-down estimate covers the project scope fairly well, thereby allowing realistic bottom-up estimates to be developed (by allocating them sufficient, meaning as close to the actuals, time and resource available), and good bottom-up estimates at task level help reinforce assumptions made in the top-down estimates of the overall project.

2.2 'BOTTOM UP' ESTIMATING TECHNIQUE

Bottom-up estimating uses the estimates of individual work packages or activities (as defined by the Work Breakdown Structure) which are then summarised or "rolled up" to determine an overall cost estimate for the project. This type of estimate is generally more accurate than other methods since it is looking at costs from a more granular perspective. Each line item in the Bottom-up build should be suitably justified including why it is efficient. The Bottom-up approach is used to produce the estimates for Access Arrangement projects that are currently in progress and approved beyond the Gate 1 phase.

2.2.1 ADVANTAGES OF BOTTOM-UP ESTIMATING

One of the major advantages of bottom-up estimating is that the project estimate can be quite accurate for individual tasks. However, this is dependent upon all project task and cost elements being included within the estimating framework. Additionally, bottom-up estimating should involve many members of a particular project, which can be a benefit in terms of project/team morale and involvement.

2.2.2 DISADVANTAGES OF BOTTOM-UP ESTIMATING

One of the primary disadvantages of bottom-up estimating is that it can lead those who are in charge of tasks and also Project Managers to inflate project estimates. This can be driven by conservatism in individual estimates for task completion and/or padding of material estimates to ensure that the estimate is not "short" or "under-done".

Another drawback to bottom-up estimating is that it is difficult to actually draw up a complete and thorough list of every step and task that will be necessary for the completion of a project. It is easy to overlook a task, requirement or resource for a project or a task, a problem that will lead to major issues in the overall budget.

2.3 ESTIMATING TOOLS

2.3.1 PROJECT ESTIMATING MODEL (PEM)

Jemena currently utilises a project estimating template for estimating non-routine projects and programs of works. This spreadsheet is known as the PEM, and is a template available within Jemena's PMM library (refer document number JEM PMM PR 2542 TP 01)

The PEM template allows for direct costs, risk, and overheads to be built up as a project estimate with costs phased over the project lifecycle.

For Access Arrangements, the PEM is used to create estimates for all non-routine projects and some program of works.

2.4 ESTIMATING DEPENDENCIES

Estimating for non-routine projects and programs is subject to a number of dependencies, which are used to inform current, accurate and efficient project estimates. Some of these dependencies include:

- Current spatial network load growth;
- Actual plant performance/life;
- Applicable technical/design standards;
- Customer expectations/requirements;
- Regulatory requirements;
- Current strategic material and services contracts;
- Resource availability;
- Timeline;
- Completion of detailed design;
- Vendor availability and responsiveness;
- Environmental considerations; and
- Workplace health and safety regulations.

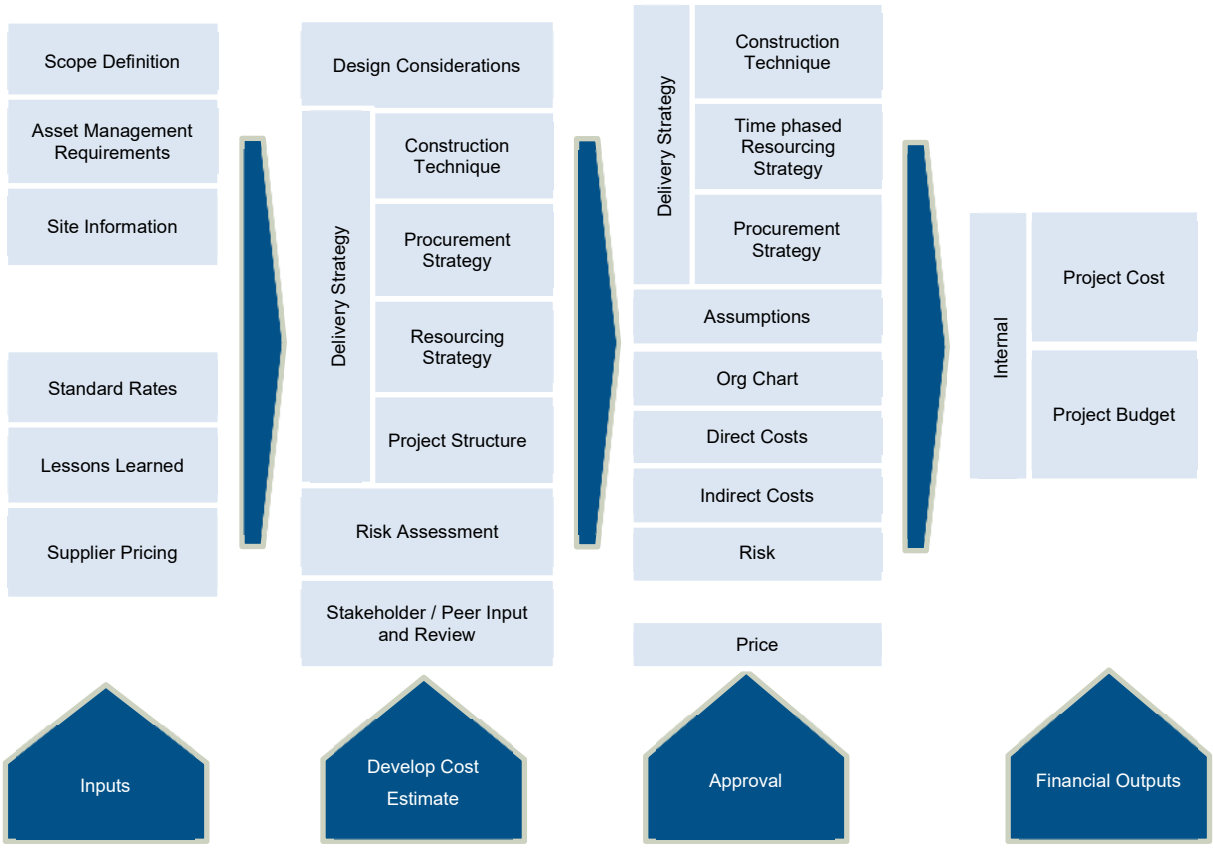
3. ESTIMATING PROCESS

3.1 ESTIMATING FRAMEWORK

Figure 3–1: Estimating Process below outlines the process for estimating a project or a program of works in line with the Jemena PMM.

Estimates are developed to align with PMM gate reviews within the project lifecycle. This is further defined in Appendix A.

Figure 3–1: Estimating Process



The objective of estimating is to determine the efficient project cost to deliver the scope of works. Cost estimates are utilised within the business in a variety of ways. Jemena considers the following uses of a cost estimate:

- From a Jemena perspective, the cost estimate determines whether a particular project or activity is to be funded for delivery.
- From a delivery viewpoint, the cost estimate represents an estimate of required expenditure for the project/activity under consideration, based on the agreed upon scope of work. Also represents a performance target.

3.2 ESTIMATE INPUTS

3.2.1 SCOPE DEFINITION

The Scope Definition is developed from the Project Mandate and captures the activities and actions required to complete a defined Project or Program of Works. In addition to the Scope of Work, it includes project objectives, specifications for the products or services being procured, project milestones and any other detail required to define the products or services to be delivered. The Scope of Works will also cover additional items like the performance reporting and mandatory requirements. The Scope of Work needs to be clearly understood throughout the estimating process, and in order to do so will generally involve:

- Customer Input;
- Jemena Technical and/or Engineering Input;
- Operational Input (Project Manager / Construction Manager); and
- Site visits.

3.2.2 ASSET STRATEGY REQUIREMENTS

As a part of defining the scope, obtaining technical and operational input will generate clarity of capability requirements required to achieve the desired outcome of the Project or Program. This will also identify any constraints and any requirements for temporary works or staging. Engineering input is sought from Asset Strategy.

3.2.3 SITE INFORMATION

Typically for non-routine projects, site visits are undertaken to assist project managers to consider as much local, current information relevant to the project estimate. Ensuring that site-information is gathered, documented, and clearly understood will aid in minimising any unforeseen site conditions that may adversely impact on the proposed delivery strategy and subsequently the cost of the project.

Typically a site inspection is required to assess:

- Site access and layout including delivery points, parking, lay-down areas and storage, spoil areas;
- Circulation throughout the site;
- Delivery routes;
- Existing utility locations;
- 3rd party crossings;
- Special site conditions (terrain, weather implications, staging requirements);
- Traffic management requirements;
- Environmental considerations;
- Construction methodology;
- Safety issues – workers, pedestrians, general public;
- Community consultations;

- Land owner issues; and
- Scoping of work.

Any remaining uncertainty is included within the project risk assessment, and the assumptions applied within the project estimate are to be clear throughout the review and approval process. Any departures from the Baseline Scope of Works are to be quantified and detailed as part of the project governance review process.

3.2.4 SCOPE DEFINITION ACTIVITIES

Scope Definition activities are undertaken to reduce the uncertainty in scope and provide more accuracy in the cost estimate. Typical Scope Definition activities, which are dependent on the stage of estimate, are (but not limited to):

- Site assessments;
- Concept/preliminary drawings;
- Functional Design/Design Basis Manual;
- Detailed equipment lists;
- Project management artefacts – schedule and identify risks;
- Budgetary pricing;
- 3rd party approval; and
- Ordering of long lead Items (if impacts overall schedule).

3.2.5 STANDARD RATES

Standard labour rates are used for estimating and costing of internal labour on projects. Also for some external activities, there are negotiated contractor standard rates. Project managers need to be aware of both the composition of these rates and the underpinning assumptions so as to avoid duplication of costs, and to ensure additional items are not overlooked.

3.2.6 LESSONS LEARNED

Jemena has a diverse portfolio of capability and experience with similar projects likely to have been previously undertaken. The estimating process calls on relevant experience from the wider business where required, and incorporates the lessons learned from past successes and failures into the planning and risk management processes. Lessons learned registers and Post Implementation Reviews are implemented with the intent of targeting the continual development and improvement lifecycle of base estimates.

3.2.7 VENDOR PRICING

Vendor pricing is subject to regular change and is dependent on variables such as volume, location and market depth. The estimating process ensures that prices used within the estimate are sourced from Vendors that are current and applicable to the volumes required.

Where there is significant procurement required for the project, the procurement manager is engaged early in the process to assist in the development of an appropriate procurement strategy.

3.2.8 OVERHEAD ALLOCATIONS

In accordance with Jemena's Cost Allocation Methodology (CAM) Policy and other Finance Policies, indirect such as network and corporate overheads, Zinfra Support Services fees, property cost recovery are charged to the projects.

Information on overhead allocations in project estimates should be obtained from Asset Investment.

3.3 DEVELOP PROJECT ESTIMATE

3.3.1 PROJECT ESTIMATE BUILDUP

A non-routine project estimate typically consists of the following elements:

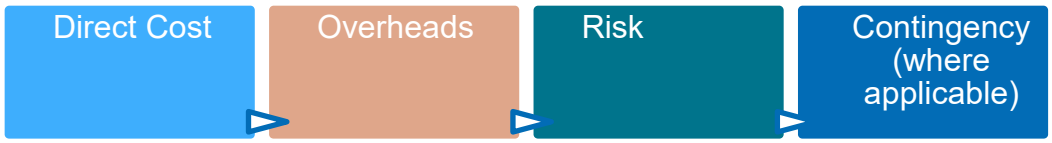


Figure 3-2 - Typical project estimate elements (graphical representation only)

3.3.2 DESIGN CONSIDERATIONS

In developing an estimate, project managers make an initial assessment of the Scope of Works contained in the request for estimate to establish the nature and complexity of the project (through requirements determination). Factors influencing the complexity of the project include detail of the design drawings, volume of work, type of structure presented in the drawings, location and accessibility. The complexity is determined by the project manager's experience and knowledge of the location of the proposed works.

3.3.3 DELIVERY STRATEGY

Developing a robust project delivery strategy can significantly affect the success of a construction project. The appropriate delivery strategy typically drives project cost, quality of design, constructability, maintenance strategy, and project completion date. Project Managers planning large projects can augment the likelihood of a successful outcome by performing a thorough assessment of the key objectives for the project and the delivery strategies available to execute it.

Upon collection of all information pertaining to the project, the project manager will assess the construction technique, procurement strategy, resource strategy and organisational structure for the project.

3.3.4 CONSTRUCTION TECHNIQUE

The construction technique is developed in close consultation with the Project Manager and Construction Manager to identify any key constraints on the delivery of the project. Examples of site access restrictions are busy roads or inaccessible terrain. This ensures the project manager can allow for the required plant and construction hours to complete the required activities.

3.3.5 PROCUREMENT STRATEGY

Procurement strategy is aimed at mapping the optimum route to achieving the project objectives. This involves identifying what is required and investigating the market's capacity to deliver, while accounting for the associated risks, opportunities and constraints.

The procurement strategy needs to establish:

- what is to be procured;
- timelines to be achieved;
- budget constraints and cost management;
- an analysis of the market capability;
- the approach for engaging the market; and
- implications associated with each potential option.

To meet the requirements of the project procurement strategy, the project manager requests pricing for any non-stock materials and sub-contractor costs through the procurement manager.

3.3.6 RESOURCING STRATEGY & ORGANISATION STRUCTURE

The Project manager makes an assessment of the resourcing requirements of the project in consultation with the Construction Manager and Resource Planner. A decision is made on the required mix of skill sets, including civil, which will form the basis of the estimate. When internal labour is utilised on projects, effort is made to schedule the resources in such a way to efficiently optimises costs.

3.3.7 RISK ASSESSMENT

Risk is allocated based on a quantitative and qualitative risk assessment of plausible risks that could affect the project. These risks are captured as an element of the estimating process.

Given that risks may or may not materialise, the extent to which the total amount required to respond to each risk is considered. Where a defined scope exists, Project managers can allocate 'risk control' cost to mitigate risk and allocate this risk control cost within the direct cost of a project estimate. Residual Risk costs are allocated to the risk portion of the project estimate as defined by the project Risk Assessment.

From Gate 1 onwards, as a part of the Project Estimate a Project Risk Register containing all risks identified for the Project, their current assessment and the identified risk mitigation strategies to reduce the likelihood and consequence of each risk must be completed. Project Risks and any associated controls must be costed within the Risk Register.

As risk management is an ongoing process over the life of a project, the Risk Register must be considered as a 'snap shot' of relevant risks at one point in time.

It is also important to recognise the uncertainty associated with projects, as not all scope items or risks can be known or estimated especially in the early stages of a project. Cost uncertainty (sometimes called Scope Factor Allowance (SFA)) can be allocated within the Risk Budget of a project. Typically uncertainty is included in project estimates prior to Gate 1. By the time a cost estimate has been developed at Gate 1 and beyond, the scope and risks can be better defined and quantified, and uncertainty factors are no longer required. For Access Arrangement

estimates, 10% of SFA is allocated to labour costs and 30% to material and subcontractor costs. Refer to Appendix A for guidance on the application of uncertainty factors.

The sum of the unmitigated costs and uncertainty from the projects/program is to be collated to be managed at a portfolio level and controlled by Investment Management (IM) in SAP. Risk budget cannot be committed to the project by the Program or Project Manager without Investment Management approval, as established in the PMM Project Variation Procedure (JEM PMM PR 2519).

3.3.8 ESTIMATE FORMAT

A completed PEM contains all the assumptions, constraints, inclusions, exclusions, risks, and supporting documentation to progress the project to the approval stage. The template ensures that all estimates are provided in a format such that following information can be clearly extracted:

- Project Cost;
  - Internal Labour
  - Materials
  - Subcontractors (including Restorations where applicable)
- Jemena Overheads and Zinfra Support Services fees
- Risks;

During early stages of the PMM up to FID at Gate 3, the estimating accuracy of project stages can be variable within the various project stages. The overall project cost estimating accuracy over the life of a project will be refined as the project progresses through the gating stages. On the other hand a detailed estimate (i.e. within ±10%) of the funds required to get to the next gate is a pre-requisite to establish an agreed scope (deliverables and schedule) with stakeholders to get to next stage. Refer to Appendix A for guidance on expected project accuracy ranges.

3.3.9 STAKEHOLDER / PEER REVIEW AND REVIEW

A review is undertaken to ratify the estimate and specifically review the resources allocated to the project to confirm the resource allocation is reasonable. This review is based on lessons learned, the complexity of the project and identified risks. The review will determine whether too many or too little resources are allocated.

Further to the review for approval the Project Manager is responsible for the post implementation review, as a part of Gate 7, in order to give appropriate feedback to the project estimators and other stakeholders for future projects. This will entail comparing the actual project costs to planned costs to identify discrepancies between assumed requirements and actuals completed in the field. This will drive continuous improvement.

3.3.10 VARIATION AND CHANGE MANAGEMENT

‘Change’ refers to a governance process for dealing with permanent adjustments to time, cost, scope or quality that are and can be managed within approved Business Case tolerances for that project.

A ‘Variation’, in contrast, is required for a change to time, cost, scope or quality that exceed approved Business Case tolerances or where there is any doubt as to whether the project would have been approved had the consequences of that change been known at the point of initial approval.

All approved estimates shall form the baseline for any future variation/change management. Future variation/change documentation shall clearly articulate any variances from the approved baseline by documenting the facts.

Change management should be concerned with more than just controlling expenditure against the contingency budget. It is an important governance function that closely tracks the project and leaves a documentary trail that describes the challenges that the project faced and the decisions that were made. The change register is an important record for any audit, post-implementation review and for identifying improvements required in business and project management processes.

It is important for the integrity of the process that neither the risk budget nor the contingency fund is used to pay for changes to time, scope or quality that are outside the tolerances of the business case; these need to be dealt with through the Variation process. However, for this to be a reasonable standard, there needs to be an appropriate degree of rigour in the determination of time, scope and quality.

4. REFERENCE DOCUMENTS

1. Project Estimating Model (PEM) (JEM PMM PR 2542 TP 01)
2. Jemena Procurement Policy (JEM PO 0026)
3. Jemena's Project Management Methodology (JEM GU 2500)
4. Property, Plant And Equipment (FIN-REP-012)
5. Capex, Opex And Project Accounting (FIN-REP-024)
6. Cost Allocation (FIN-REP-028)
7. Jemena Cost Allocation Methodology
8. Variation Register and Variation Request – Work Instruction (JEM PR 2519 WI 01)
9. Gate 3 Project Peer Review Procedure

5. APPENDIX A

PROJECT ESTIMATION MILESTONES

Milestone	Expected Project Accuracy Range	Uncertainty factors / SFA	Scope	Next Stage Requirements	Basis of Project Estimate – Non - Routine	Level of Work Required
AA or Project Mandate	± 50% or better	Internal Labour ≤ 10% Material and Subcontractor ≤ 30%	High Level or Better	• Deliverables • Schedule for deliverables • Detailed Top-Down or Bottom-Up Estimate ± 50%	• Utilises a Top-Down approach. • Utilise information from similar projects.	• Minimal Scope • Identify similar projects to validate figures
Gate 1	± 50% or better	Defined via risk assessment	High Level or Better	• Deliverables • Schedule for deliverables • Detailed Bottom-Up Estimate ± 30%	• Utilises a Top-Down or Bottom-Up approach. • Utilise information from similar projects. • Initial Budget values.	• On completed Project Mandate: • Preliminary Schedule & Risk • Identification of Long Lead Items
Gate 2	± 30% or better	Defined via risk assessment	Confirmed Scope of Works	• Deliverables • Schedule for deliverables • Detailed Bottom-Up Estimate ± 10%	• Mostly uses a Bottom-Up approach. • Budget hours from internal labour • Recent quotes/tender prices or budget estimates	• Scope Finalised • Preliminary Drawings • Preliminary Delivery Methodology • Refined Schedule and Risk Assessment • Site Walk Through • Budget prices • Site Survey (as required) • Major Equipment List Identified • Stakeholder Consultation/Approvals (as required)

Milestone	Expected Project Accuracy Range	Uncertainty factors / SFA	Scope	Next Stage Requirements	Basis of Project Estimate – Non - Routine	Level of Work Required
Gate 3	± 10% or better	Defined via risk assessment	Detailed Scope of Works		• Fully uses a Bottom-Up approach • Hours from Internal Labour using CATS Time-writing rates for resources • Quoted/Tender price from contractor • Approved delivery strategy • Current Overhead • Itemised Risks	• Further Site Visits • Additional testing (as required) • Ordering of Long Lead Items (if impacts overall schedule). • Sufficient design to enable estimate • Equipment List Identified • Detailed Schedule • Detailed Risk Assessment • Validate using Subject Matter Experts