

# Jemena Electricity Networks (Vic) Ltd

## 2016-20 Electricity Distribution Price Review Regulatory Proposal

Attachment 7-10

JEN cost estimation methodology

Public

30 April 2015



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## GUIDELINE

# COST ESTIMATION METHODOLOGY


ELE PR 0170

Revision Number: 2


Revision Date: 13/04/2015

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## INTERNAL

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## DOCUMENT HISTORY

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Revision	Date	Author	Description of Changes
1	12/12/2013	Nirooshan Sachithanathan	Initial document for comment
2	13/04/2015	Vince Marziale	Revised to include comments from Service Delivery and Asset Management

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## OWNING FUNCTIONAL GROUP & DEPARTMENT / TEAM

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Service Delivery : Planning & Contracting : Portfolio & Planning

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## REVIEW DETAILS

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Review Period: 13/04/2015 + 1 years

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Next Review Due: April 2016

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# 1 INTRODUCTION

## 1.1 PURPOSE OF PROJECT ESTIMATE DEVELOPMENT PROCESS

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This document sets out the cost estimating framework for all projects and programs of work for Jemena Electricity Networks (VIC) Ltd (**JEN**). It explains how the cost estimation framework uses the best available information to develop project estimates, depending on the nature and proposed timing of the expenditure. Documenting the project estimation process reinforces the importance of applying the framework consistently to achieve the objective of developing accurate project estimates.

## 1.2 BACKGROUND

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Jemena undertakes construction, operations and maintenance work on JEN's electrical infrastructure assets. It is essential that JEN is able to develop accurate project estimates for its future work program.

Accurate budgeting depends on the consistent application of a robust estimating framework. The cost estimation process described in this document promotes consistently accurate budgeting by ensuring that:

- all relevant inputs are considered – including: scope definition; asset management requirements; site information; standard rates; and supplier pricing;
- project estimates reflect the detailed design and delivery strategy, including construction, procurement and resourcing; and
- risk is treated appropriately, recognising that JEN undertakes a portfolio of projects and programs of work, and scope adjustment factors should be applied at the portfolio level.

## 1.3 OVERARCHING GOVERNANCE PROCESS

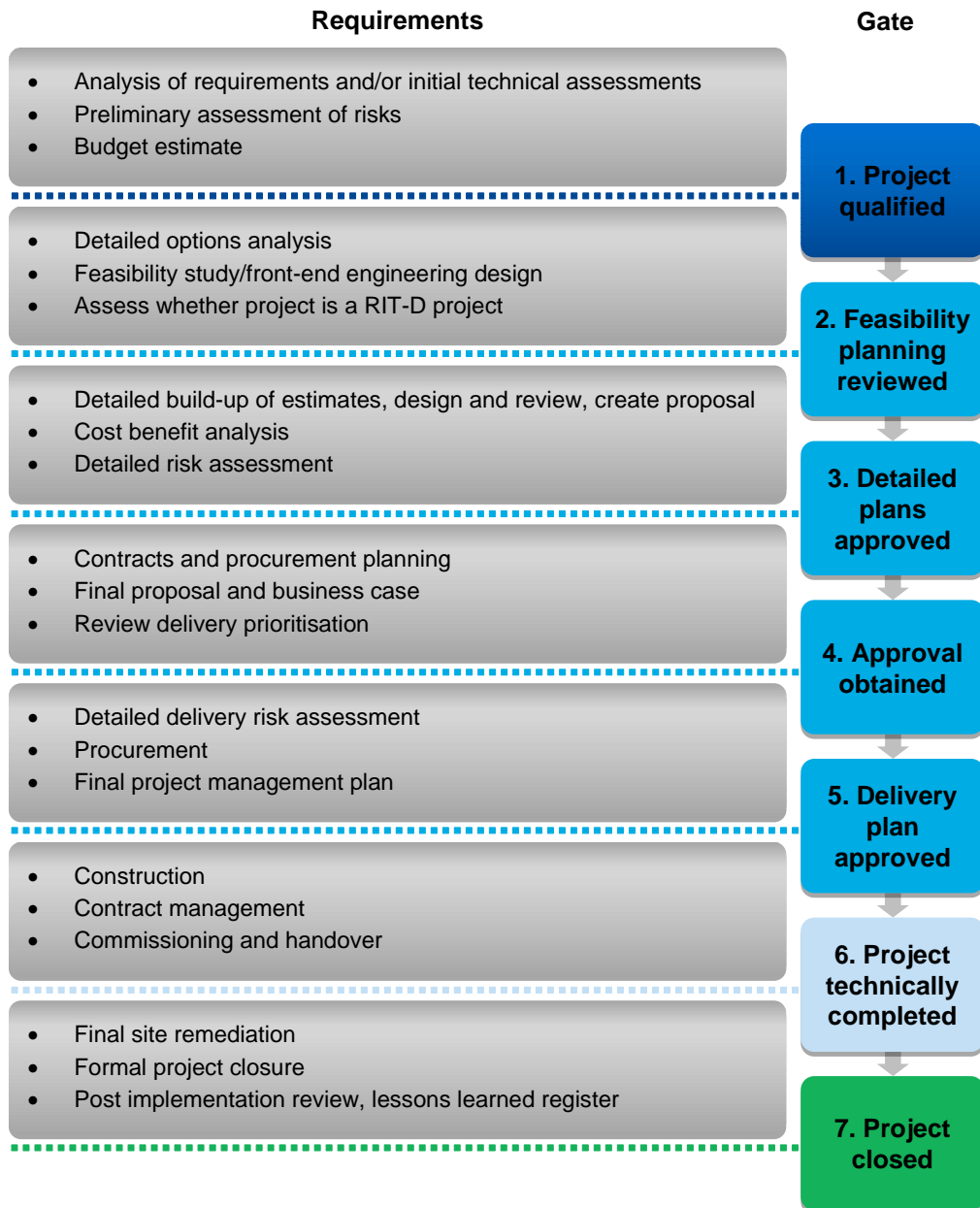
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The cost estimation framework is part of JEN's broader governance process for asset management. This process includes a number of tools that help us ensure that we achieve efficient and prudent investment. The key elements in our governance process are briefly summarised below:

- **Project Management Methodology (PMM)**, which improves and standardises scoping, estimation and delivery management of network infrastructure programs and includes a project governance gating process for managing projects from inception through to delivery and completion, which ensures that checks are undertaken at critical milestones of the project in compliance with our delegation of financial authority policy.
- **Seven-year Asset Management Plan (AMP)**, which summarises our approaches for forecasting and governance, evaluating business cases and making investment decisions. The AMP also includes a rolling five-year forecast of the capital work we need to undertake to maintain a safe, reliable network, and is updated annually.
- **IT Asset Management Plan (IT AMP)**, which focuses on our information and communications technology assets, including metering and SCADA.
- **Capital and Operating Works Plan (COWP)**, covers a 2 year time horizon and is derived from the Asset Management Plan (AMP)

- **Portfolio and planning process**, which governs the prioritisation of projects and guides us in managing issues, risks, variation and escalation across our whole capital works portfolio.
- **20-year Strategic Asset Management Plan (SAMP)**, which ensures we adapt over time to maintain the relevance of our services to our customers.

The following diagram illustrates the PMM project governance gating process:



In terms of the project governance 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 well substantiated. In addition, we also explain that works planned beyond a two-year time horizon are subject to top down project estimates.

## 1.4 STRUCTURE OF THIS DOCUMENT

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The remainder of this document is structured as follows:

- Section 2 describes the project estimation objectives and timeframes.
- Section 3 discusses top down and bottom up estimation techniques;
- Section 4 provides details of the project estimation process; and
- Section 5 describes the roles and responsibilities of JEN personnel within the estimating process.
- Section 6 lists reference documents.

## 2 PROJECT ESTIMATION OBJECTIVES AND TIMEFRAMES

This section provides a high level explanation of the project estimation objectives and timeframes. It also explains the distinction between routine and non-routine projects, and the cost advantages of grouping routine projects into programs of work.

### 2.1 OBJECTIVES OF ESTIMATING GOVERNANCE FRAMEWORK

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The objectives of the estimating governance framework is to:

- provide accurate and consistent project estimates for all works, recognising the nature of the proposed work and its likely timing;
- ensure that business cases and forecast programs have been estimated using appropriately sourced, realistic and efficient input data;
- provide project estimates that account for safety, environmental and regulatory requirements;
- identify opportunities for innovation;
- identify the risks associated with the relevant works and ensure that these are communicated to Project Managers (for example the likelihood of encountering rock during excavations, see Appendix 1);
- ensure appropriate estimates are prepared at different stages of the PMM project governance gating process, as described in section 1.3;
- ensure value for money for our customers; and
- ensure there is a formal change process if circumstances change.

### 2.2 OBJECTIVES OF ESTIMATING TEAM

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The Estimating Team has the following objectives:

- accurate, consistent and repeatable estimations are applied to works in the future program;
- risks are identified and managed;



- ensure that JEN's decision making documentation includes estimates that are efficient, sustainable and provide value for money solutions;
- provide a basis for on-going project estimate refinement by documenting the assumptions made; and
- identify interdependencies and sequencing of related works to ensure that all activities and synergies are recognised.

## 2.3 ESTIMATION TIMEFRAMES

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JEN's Capital and Operating Works Plan (COWP) covers a two (2) year time horizon and is derived from the Asset Management Plan (AMP). The PMM project governance gating process described in section 1.3 requires more detailed forecasts to be developed as business cases progress through each gate. Appendix 2 provides details of the project estimation milestones and the different estimation processes that apply.

For work that falls outside the timeframe provided by the COWP, it is appropriate to adopt a top down cost assessment. Further details on the top down and bottom up cost estimation techniques are provided in section 3.

## 2.4 ROUTINE AND NON-ROUTINE PROJECTS

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A routine network project is work in relation to a pre-defined set of assets, which is subject to a scheduled timeframe. In contrast, a non-routine project is focused on addressing a specific network issue, such as an asset failure or network constraint.

Productivity and cost efficiencies can be achieved by packaging routine projects into programs of work. In particular, treating multiple routine activities as a single program of work allows synergies to be realised in project management, resource allocation and field crew co-ordination. In addition, continuous improvement may be achieved as work crews gain expertise in delivering consistent routine programs of work.

The following examples highlight projects that can be delivered as a program of work:

- non-tension connector replacement;
- surge diverter replacement;
- service replacement;
- cross arm replacement;
- conductor replacement;
- animal proofing installation; and
- vibration damper and armour rod installation.

Whether work is delivered as a project or program, it must be subject to detailed project estimates prior to business case approval through the PMM project governance gating process. In the next section we discuss the bottom up cost estimation technique, which is central to obtaining business case approval. It should also be noted that a number of top down reviews are also applied to ensure that bottom up project estimates are robust.

Details of the cost estimation process are provided in section 4.

## 3 ESTIMATING TECHNIQUES AND DEPENDENCIES

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

At a high level, JEN's cost estimating approach draws on the best available information, given the nature and proposed timing of the expenditure. In broad terms, top down and bottom up forecasting methods are used in combination to ensure that the project estimate is fit for purpose in the context of the PMM project governance gating process and the two-year rolling program as defined by the COWP.

Further detail of the cost estimation process is provided in section 4.

### 3.1 TOP DOWN ESTIMATING TECHNIQUE

The top down estimating technique relies on historical data from completed, similar projects to estimate the costs of the proposed project. For non-routine augmentation and replacement projects, this approach is 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 detailed scopes of work have not been developed).

The top down estimates are created using 'modules' of data maintained within JEN's internal databases. These modules consist of labour, materials and contract costs, which are sourced from:

- historical data from past projects;
- recent tender prices (at the time of estimating e.g. within six (6) months);
- expected labour costs (consistent with Jemena's labour model); and
- period contract 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. The project costs from the model are escalated to reflect the proposed project timing (for the change in price of capital inputs, wages, CPI etc).

### 3.2 BOTTOM UP ESTIMATING TECHNIQUE

Both bottom up and top down estimation techniques are applied in accordance with Jemena's Project Management Methodology. Bottom up estimating is a thorough estimate of the project by estimating each and every work package.

All estimates are developed using the Easy Cost Planner (**ECP**) module of SAP. Estimating templates have been developed within ECP for each of the major category of work for non-routine and routine network projects. The templates are based on appropriate design and construction standards using Bills of Materials, Standard Task lists and Base Planning Objects to ensure that each estimate is developed in a consistent and comprehensive manner. The categories of work covered by the estimating templates include:

- Zone Sub Station Development;
- Distribution Sub Station Development;

- Indoor Substation Works;
- Underground Works;
- Overhead Works; and
- Public Lighting Works.

All estimates that involve civil works under \$25,000 are developed using the Schedule of Rates negotiated under a Jemena tender panel for civil works. Civil works over \$25,000 are quoted in accordance with Jemena's Purchasing Policy and are also subject to competitive tender processes to derive efficient, market competitive rates.

JEN bi-annually engages an independent expert to prepare their own, independent project estimates for a cross-section of JEN's forecast program of works. The project estimates prepared by the independent expert are used to cross-check that our own estimates are reasonable and those for non-routine projects are within acceptable tolerances.

Section 4 provides further information on the bottom up estimation process, and the top down reviews to ensure that the resulting estimates are robust.

### 3.3 ESTIMATING DEPENDENCIES

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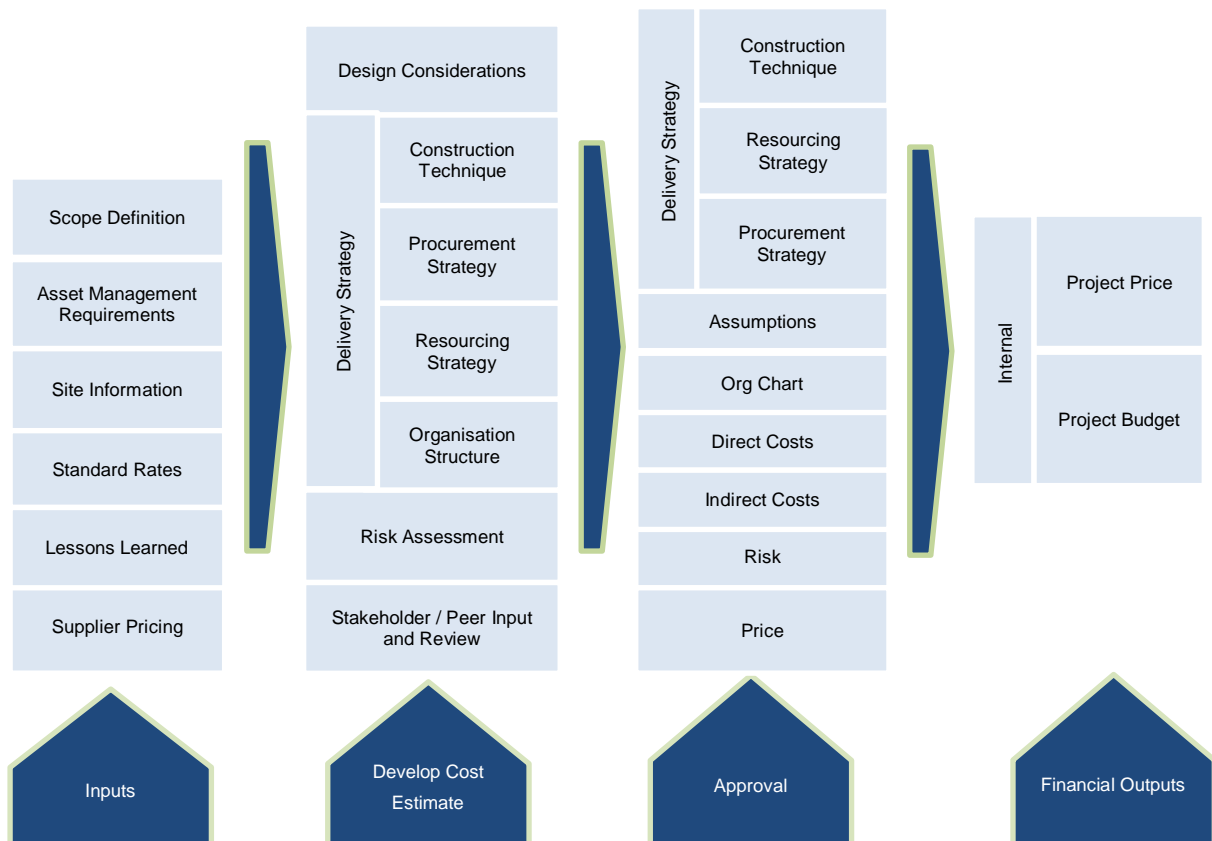
The estimating framework is subject to a number of dependencies, which are used to inform current, accurate and cost reflective estimates. Some of these dependencies include:

- current spatial network load growth;
- actual plant performance/life;
- applicable technical standards;
- customer expectations/requirements;
- regulatory requirements;
- Jemena Field Services Agreements;
- resource availability;
- cost escalation trends for labour, contracts and materials; and

## 4 WORKPLACE HEALTH AND SAFETY REGULATIONS.ESTIMATING PROCESS

### 4.1 ESTIMATING FRAMEWORK

The process outlined in the following section is used for estimating a project or a program of works. Estimates are conducted at different stages of the project lifestyle depending on the stage and requirements of the Project Manager as outlined further in Appendix 2.



The remainder of this section discusses the 'inputs' and the 'develop project estimates' phases shown above. The approval process and the financial outputs are shown for completeness. As discussed below, the project outcomes are reflected in future project estimates.

### 4.2 INPUTS

#### 4.2.1 SCOPE DEFINITION

The scope of work needs to be clearly understood throughout the estimating process, and in order to do so will generally involve:

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

#### 4.2.2 ASSET MANAGEMENT REQUIREMENTS

As a part of defining the scope, obtaining technical and operational input will generate clarity of capability requirements. Typically, engineering input is sought from JEN's planning engineers for larger augmentation and connection projects and sought from JEN's asset performance, primary and secondary plant engineers for routine replacement type projects.

Aligning these requirements to available internal and external capacity and expertise assists in developing well-considered resourcing strategies for projects.

#### 4.2.3 SITE INFORMATION

Particularly for larger projects, site visits are undertaken to assist project estimators to consider as much local, current information relevant to the project estimate. Site information is gathered, documented, and clearly understood to also prevent any unforeseen site conditions adversely impacting 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;
- office space;
- existing utility locations;
- special site conditions (terrain, weather implications);
- traffic management requirements;
- environmental considerations;
- temporary work requirements;
- construction methodology;
- safety issues – workers, pedestrians, general public;
- land owner issues; and
- scoping of work.

Any remaining uncertainty is included within the formal risk assessment, and the assumptions applied within the project estimate are to be clear throughout the review and approval process.

#### 4.2.4 STANDARD RATES

JEN uses standard labour and plant rates for estimating and costing both internal labour and plant on projects. Project estimators are 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.

#### 4.2.5 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.

#### 4.2.6 SUPPLIER PRICING

Supplier pricing is subject to regular change and is dependent on variables such as volume and location. The estimating process ensures that prices used within the estimate are sourced from suppliers 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.

### 4.3 DEVELOP PROJECT ESTIMATE

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#### 4.3.1 DESIGN CONSIDERATIONS

In developing an estimate, project estimators make an initial assessment of the scope 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 estimator's experience, information provided by the project manager and knowledge of the location of the proposed works.

#### 4.3.2 DELIVERY STRATEGY

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

#### 4.3.3 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. For example site access restrictions such as busy roads or inaccessible terrain. This ensures the project estimator can allow for the required plant and construction hours to complete the required activities.

#### 4.3.4 PROCUREMENT STRATEGY

To meet the requirements of the project procurement strategy, the project estimator requests pricing for any non-stock materials and sub-contractor costs through the procurement manager via the project manager. Stock material pricing is maintained within SAP ECP.

#### 4.3.5 RESOURCING STRATEGY & ORGANISATION STRUCTURE

The project estimator makes an assessment of the resourcing requirements of the project in consultation with the project manager, 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. All external civil rates are subject to a set schedule of rates or project specific quote from Jemena's panel

of accredited contractors in accordance with the Jemena Pricing Policy. When internal labour is utilised on projects, effort is made to schedule the resources in such a way to efficiently optimise costs.

#### 4.3.6 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, JEN's project estimators allocate 'risk control' cost to mitigate risk and allocate this to the project estimate. Residual risk costs (mitigated costs) are also allocated to the project as defined in the project risk register.

It is also important to recognise the uncertainty associated with projects, as not all risks can be known or estimated. Cost uncertainty is managed at the portfolio level and controlled by Investment Management in SAP.

#### 4.3.7 STAKEHOLDER / PEER INPUT AND REVIEW

On completion of the estimate a completed estimation document is provided to the project manager which contains all of the assumptions, risks, and supporting documentation to provide sufficient information to assess the estimate and progress the project to the approval stage. 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 of the estimate in order to give appropriate feedback to the project estimators and other stakeholders for future projects.

The project estimator ensures that actual construction costs are compared to planned labour/materials and plant to identify discrepancies between construction standards and actuals completed in the field.

The project estimator analyses and documents reasons for differences and if applicable, records situations where the construction activities are different to the standard Bill of Material (BOM) or Standard Task List (STL) or base planning objects (BPOs). The reason for the variance is entered into an issue log and then sent to the Asset Standards team for review to align the construction standard to current work practices.

The Estimating team updates the appropriate SAP ECP templates to reflect new BOMs, STLs and/or BPOs when the construction standards are changed by the asset standards team. With the introduction of Investment Management in SAP and business objective to apply to 2-year rolling program, estimates are also scaled to adequately account for escalation of wages, materials, CPI, etc in future years.

## 5 ROLES AND RESPONSIBILITIES

The estimating process requires a number of stakeholders providing timely information to project estimators to enable them to develop an accurate estimate of the works, including labour, materials, equipment and contract service activities and costs.

In addition, each stakeholder is required to communicate issues/risks and assumptions to ensure that project managers and construction personnel understand how the estimate has been developed; what it covers and any risk items that have been considered.

### 5.1 ESTIMATING TEAM LEADER

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The Estimating Team Leader:

- ensures that an appropriate and consistent governance is followed so that the estimating process, meets performance measures and quality assurance;
- ensures the project manager/ planner registers the project in SAP and maintains records in relation to:
  - Requests for quotation (Not necessary if the estimate is received as a project folder)
  - Clear scope of works
  - Design/Drawings / plans as appropriate (these are required to detail structures and construction standards to be applied)
  - Dial-Before-You-Dig documents where applicable
  - All project underground cable route metres if drawings provided are not to scale
  - SAP or PM project number
  - Supply outage requirements
  - Before and after diagrams
  - Photographs as applicable
  - Traffic restriction times that will impact on the site working time availability.
  - Applicable site allowances and associated costs.

In addition, the estimating team leader must ensure that this record specifies any additional project information that will influence the final estimate such as, temporary supply works, timing of the works, works completed by others, etc.

### 5.2 PROJECT MANAGER

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The project manager:

- manages the project's life-cycle. The project manager initiates the project and provides the estimating team with appropriate, clear, accurate project information (scope of works);
- ensures that all the estimation is undertaken by a JEN project estimator so that consistent and agreed processes and systems are used in a uniform and appropriate manner;



- 
- performs the process steps to ensure that performance measures and quality requirements are achieved;
  - communicates with all customers and other stakeholder departments as appropriate;
  - seeks additional information when required;
  - reviews the estimates to ensure costs are within project budget;
  - communicates appropriate cost or scope changes to the project estimator to undertake changes to the construction estimates; and
  - initiates a close out meeting with all relevant stakeholders when project is complete.

### 5.3 ESTIMATING TEAM

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The estimating team:

- performs the process steps to ensure that performance measures and quality requirements are achieved;
- assesses the project file and verifies its detail via consultation with the project group;
- conducts site visits if required and seeks technical advice from Field Services delivery wherever necessary;
- identifies anomalies with SAP materials, labour and subcontractor costs as appropriate; and
- ensures that the final estimate is as accurate as possible.

## 6 REFERENCE DOCUMENTS

1. Risk Management Guidelines for Jemena Electricity Networks (ELE GU 0902)
2. Jemena Electricity Networks Network Projects Business Cases Risks Budgeting and Assessment Guidelines (JEN GU 2502)
3. Electricity Estimating Governance (JEN GU 0106)
4. Jemena Procurement Policy (JEM PO 0026)
5. Jemena's Project Management Methodology.

## APPENDIX 1. OCCURRENCE OF ROCK IN THE JEN NETWORK

As shown in the map labelled NW which is most of the JEN Network it is primarily shaded Pink and labelled Qvn for the newer volcanic. The rate of degradation of the rock and movement of soils by wind and water will influence the depth to encounter the rock. This highlights the existence of rock and at far shallower locations than the SE and inner East of Melbourne.

**Figure 1: South West Melbourne**

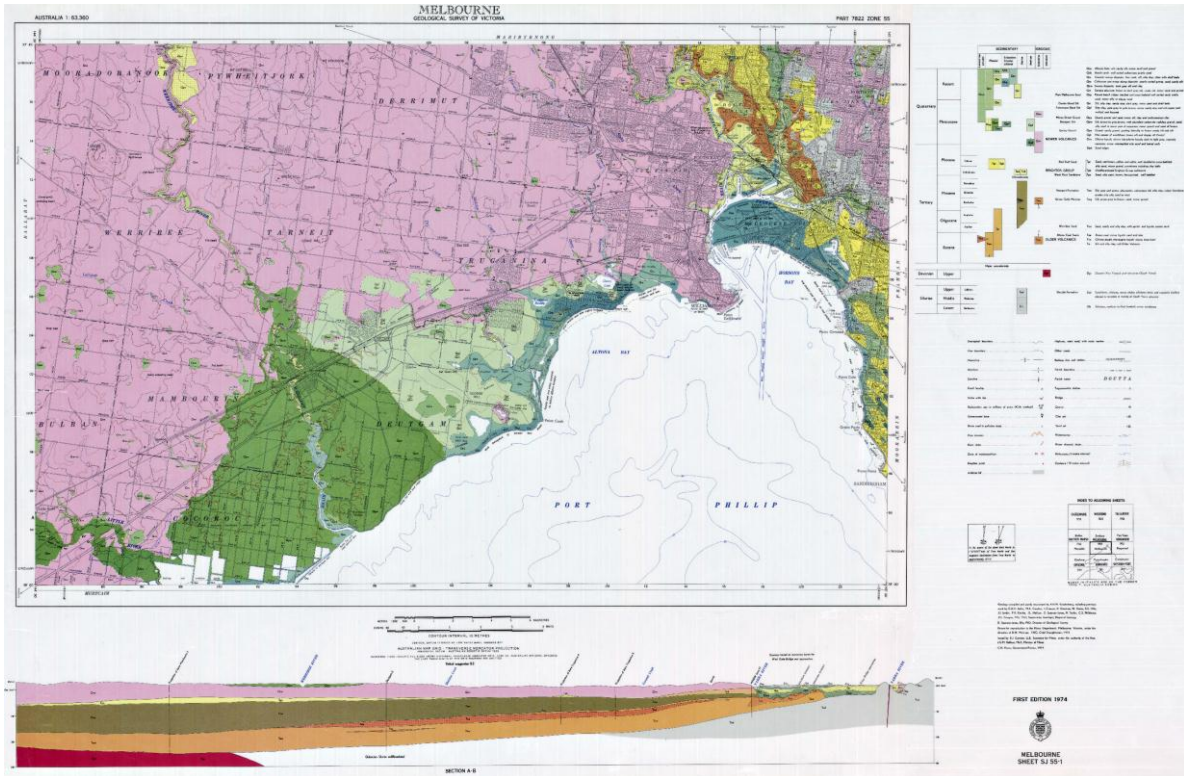


Figure 2: South East Melbourne

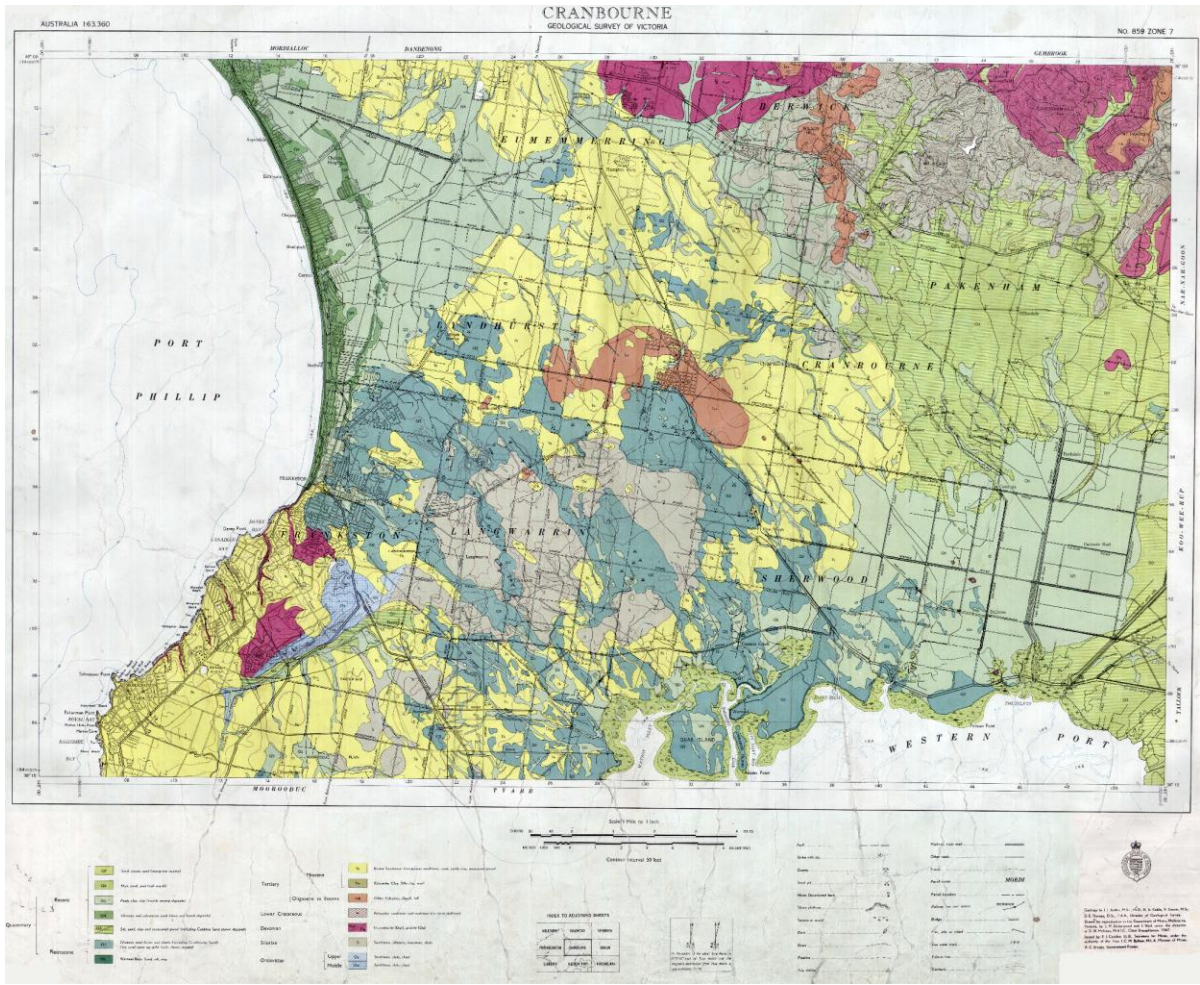




Figure 3: East/North East Melbourne

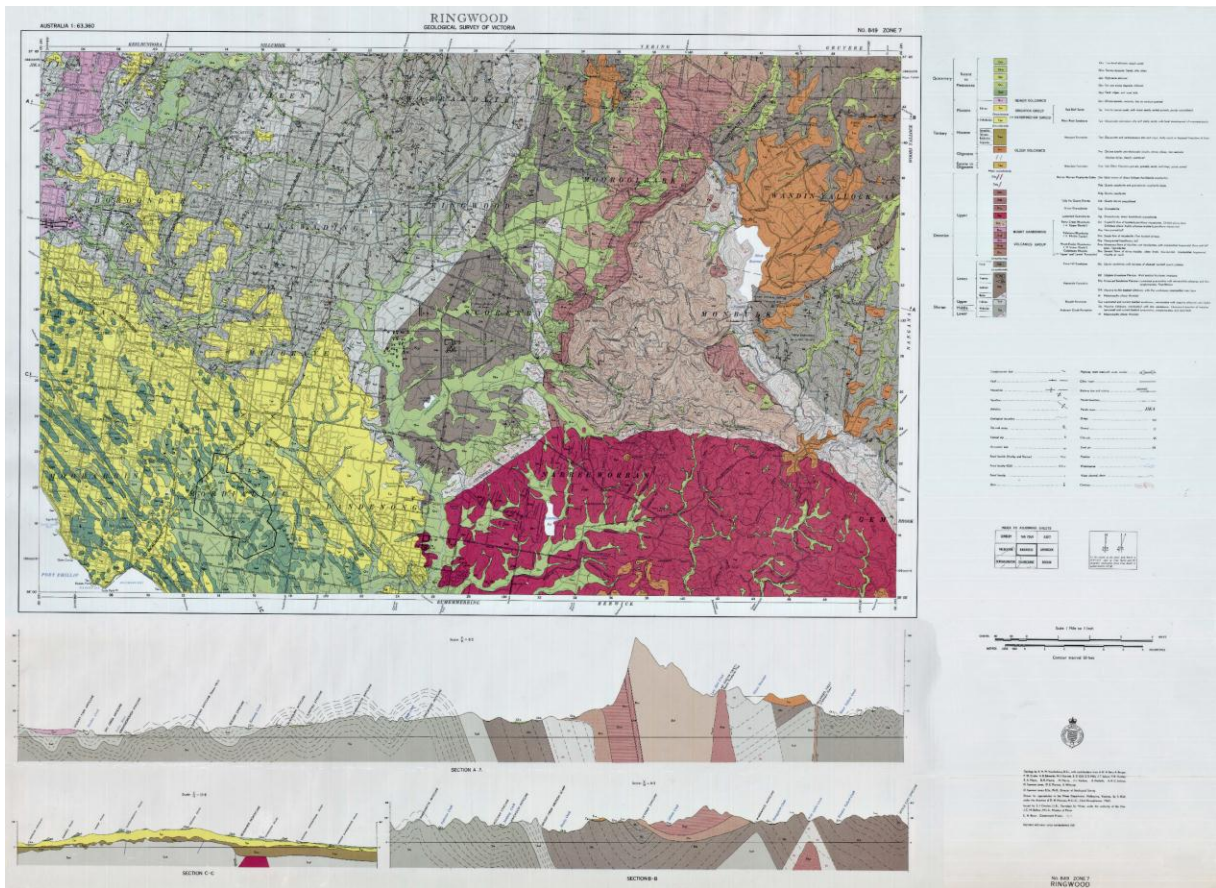
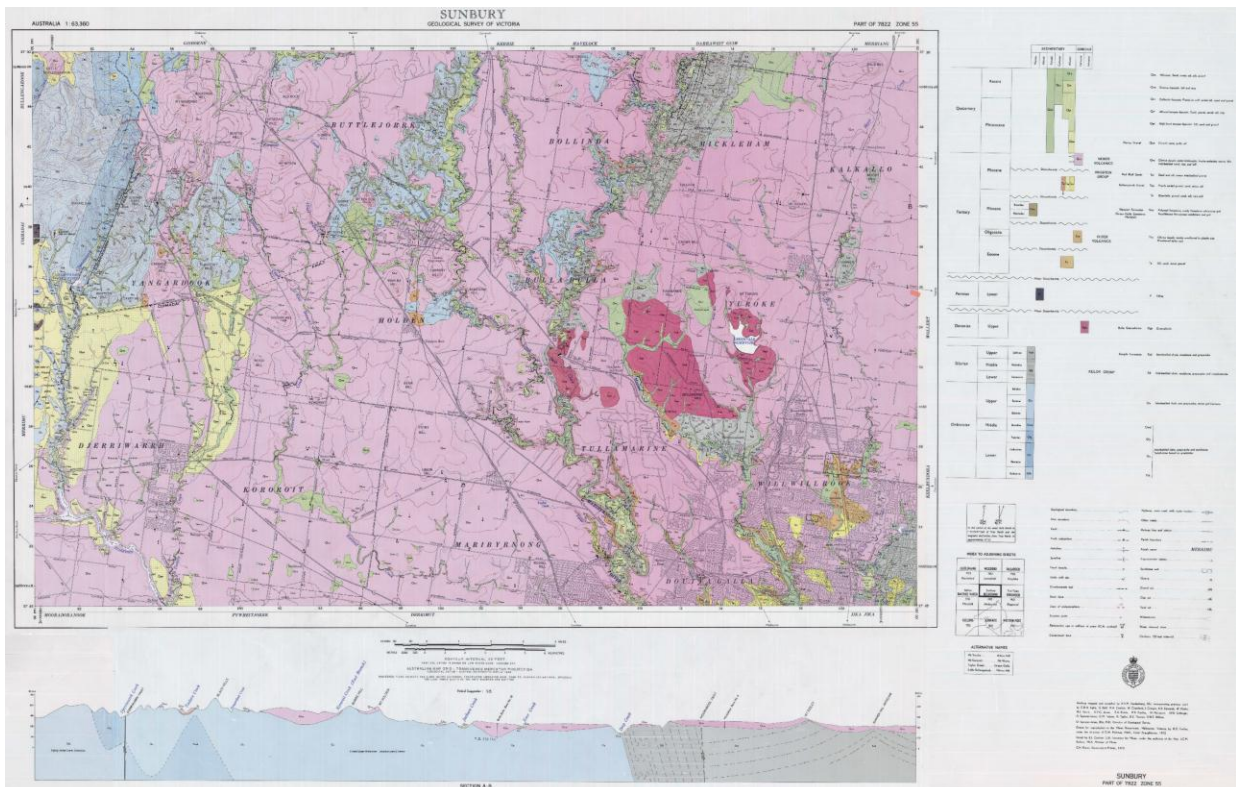


Figure 4: North West Melbourne



The table below indicates the assumptions made by Jemena project estimators for occurrence of rock in specific regions of the JEN network. This information is based on historical knowledge of the JEN network.

Suburb	Municipality	Postcode	% of Rock
Aberfeldie	Moonee Valley	3040	70
Airport West	Moonee Valley	3042	50
Alphington	Darebin	3078	95
Ascot Vale	Moonee Valley	3032	30
Attwood	Hume	3049	30
Avondale Heights	Moonee Valley	3034	20
Banyule	Banyule	3084	10
Batman	Moreland	3058	90
Braybrook	Maribyrnong	3019	70
Broadmeadows	Hume	3047	70
Brooklyn	Brimbank	3025	90
Bulla	Hume	3428	60
Bundoora	Darebin	3083	70
Campbellfield	Hume	3061	75
Clarkefield	Hume	3430	60
Coburg	Moreland	3058	70
Coolaroo	Hume	3048	50
Coonans Hill	Moreland	3044	60
Couangalt	Macedon	3437	50
Craigieburn	Hume	3064	50
Cross Keys	Moonee Valley	3041	40
Dallas	Hume	3047	50
Diggers Rest	Melton	3427	60
Eaglemont	Banyule	3084	10
Essendon	Moonee Valley	3040	20
Essendon Airport	Moonee Valley	3041	20
Essendon North	Moonee Valley	3041	20
Fairfield	Darebin	3078	90
Fawkner	Moreland	3060	20
Flemington	Moonee Valley	3031	50
Footscray	Maribyrnong	3011	90
Gisborne South	Macedon	3437	60
Gladstone Park	Hume	3043	50
Glenroy	Moreland	3046	50
Goonawarra	Macedon	3429	50
Gowanbrae	Moreland	3043	10
Greenvale	Hume	3059	40
Hadfield	Moreland	3046	40
Heidelberg	Banyule	3084	10
Heidelberg Heights	Banyule	3081	50
Heidelberg West	Banyule	3081	50
Highpoint	Maribyrnong	3032	50
Hillside	Melton	3037	50
Ivanhoe	Banyule	3079	10

Suburb	Municipality	Postcode	% of Rock
Jacana	Hume	3047	40
Keilor	Brimbank	3036	10
Keilor East	Brimbank	3033	10
Keilor East	Moonee Valley	3033	10
Keilor Park	Brimbank	3042	20
Kensington	Moonee Valley	3031	50
Kingsbury	Darebin	3083	60
Kingsville	Maribyrnong	3012	50
LaTrobe University	Darebin	3083	30
Macleod	Banyule	3085	10
Maidstone	Maribyrnong	3012	70
Maribyrnong	Maribyrnong	3032	70
Meadow Heights	Hume	3048	70
Melbourne Airport	Hume	3045	10
Merlynston	Moreland	3058	60
Mickleham	Hume	3064	80
Moomba Park	Moreland	3060	50
Moonee Ponds	Moonee Valley	3039	40
Moreland	Moreland	3058	50
Newlands	Moreland	3058	70
Newmarket	Moonee Valley	3031	50
Newport	Hobsons Bay	3015	50
Niddrie	Moonee Valley	3042	10
Northland Centre	Darebin	3072	50
Oak Park	Moreland	3046	50
Oaklands Junction	Hume	3063	40
Pascoe Vale	Moreland	3044	50
Preston	Darebin	3072	50
Regent	Darebin	3073	50
Reservoir	Darebin	3073	50
Riddells Creek	Macedon	3431	60
Robinson	Maribyrnong	3019	TBD
Rosanna	Banyule	3084	10
Roxburgh Park	Hume	3064	40
Seddon	Maribyrnong	3011	30
Simpson Barracks	Banyule	3085	10
Somerton	Hume	3062	60
South Kingsville	Hobsons Bay	3015	50
Spotswood	Hobsons Bay	3015	50
Strathmore	Moonee Valley	3041	50
Sunbury	Hume	3429	60
Sydenham	Brimbank	3083	90
Travancore	Moonee Valley	3032	TBD
Taylors Lakes	Brimbank	3038	80
Thomastown	Whittlesea	3074	40
Tottenham	Maribyrnong	3012	70

Suburb	Municipality	Postcode	% of Rock
Tullamarine	Brimbank	3043	50
Tullamarine	Hume	3043	50
Upfield	Hume	3047	10
View Bank	Banyule	3084	10
West Footscray	Maribyrnong	3012	50
Westbreen	Moreland	3044	TBD
Westmeadows	Hume	3049	30
Williamstown	Hobsons Bay	3016	70
Yallambie	Banyule	3085	10
Yarraville	Maribyrnong	3013	50
Yuroke	Hume	3063	40



## APPENDIX 2. PROJECT ESTIMATION MILESTONES

Milestone	Scope	Next Stage Requirements	Basis of Project Estimate - Routine	Basis of Project Estimate – Non - Routine	Level of Work Required
AA or EDPR Budget	High Level or Better		Unit rates X Volumes Understanding of any commercials	Utilises a top down approach. Utilise information from similar projects. Unit rates utilise a bottom up approach	Minimal Scope Identify similar projects to validate figures
Project Mandate	High Level or Better	Deliverables Schedule for deliverables Detailed Bottom – Up Estimate ±10%	Unit rates X Volumes Understanding of any commercials	Utilises a top down approach. Utilise information from similar projects. Initial Budget values. Unit rates utilise a bottom up approach	Minimal Scope Identify similar projects to validate figures
Gate 1	High Level or Better	Deliverables Schedule for deliverables Detailed Bottom – Up Estimate ±10%	Unit rates X Volumes Understanding of any commercials	Utilises a top down approach. Utilise information from similar projects. Initial Budget values. Unit rates utilise a bottom up approach	On completed Project Mandate: Prelim Schedule & Risk Identification of Long Lead Items
Gate 2	Detailed Scope of Works	Deliverables Schedule for deliverables  Detailed Bottom – Up Estimate ±10%	Typically Gate 2 not required.	Mostly uses a bottom up approach. Budget hours from internal labour Recent quotes/tender prices Unit rates utilise a bottom up approach	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



Milestone	Scope	Next Stage Requirements	Basis of Project Estimate - Routine	Basis of Project Estimate – Non - Routine	Level of Work Required
Gate 3	Detailed Scope of Works		<p>Current Standard Material Contracts</p> <p>Current Unit Rates</p> <p>Current Standing Contracts</p>	<p>Complete bottom up approach</p> <p>Hours from Internal Labour using CATS Time-writing rates for resources</p> <p>Quoted/Tender price from contractor</p> <p>Approved delivery strategy</p> <p>Itemised Risks</p>	<p>Further Site Visits</p> <p>Stakeholder Consultation/Approvals (as required)</p> <p>Additional testing (as required)</p> <p>Ordering of Long Lead Items (if impacts overall schedule).</p> <p>Sufficient design to enable estimate</p> <p>Equipment List Identified</p> <p>Detailed Schedule</p> <p>Detailed Risk Assessment</p> <p>Validate using Subject Matter Experts</p>