Project Brief

Molonglo Zone Substation

7519206

Revision 4.0

Table of Contents

Completed Project Briefs to be sent to: ProjectLibrary@actewagl.com.au

Document Control

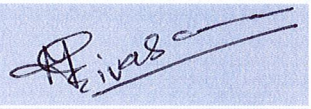
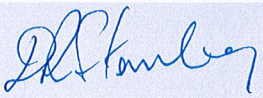
Version Control

Date	Version	Author	Description of Change
07 Dec 12	1.0	R.Goggin	Initial Draft
03 Oct 13	2.0	S Turki	General review
11 Dec 13	3.0	R.Goggin	Updated progress & revised strategy
14 Jan 14	4.0	R.Goggin	Reviewed

Related Documents

Document Title	DM5 Reference / Sharepoint Link / Location
ActewAGL Molonglo zone substation Options Development Report by SKM	

Document Authorisation

Approved by (Signature)	Name	Role	Date
	Manoj Sivasane	Acting Zone Substations Planning & Performance Manager	29/05/14
	Dennis Stanley	Manager Asset Strategy & Planning	29/9/14
	Stephen Devlin	General Manager Asset Management	

Project Background

The ACT Government is committed to major new urban development at Molonglo and North Weston. Progressive development for a total planned population of 55,000 will occur over the next 20 years. Land servicing has already commenced for North Weston, Coombs and part of Wright.

ActewAGL has a commitment to provide timely and reliable electricity supply to the new and developing urban area in Molonglo and North Weston.

Analysis will be undertaken as a part of the project initiation to explore the transfer of load within the existing network, as a result of the future commissioning of the Eastlake zone substation, and the effect this will have on the capacity available for the Molonglo Valley.

Ultimately however, it is expected ActewAGL will have insufficient redundant capacity to supply the Molonglo Valley and there will be a need to construct a new 132/11kV 55MVA substation to meet the demand increase.

Major Project Milestones

2013/14 - current

- Preparation and lodgment of substation DA
- Detailed design and construction of substation access road
- Strategy revised to supply the Molonglo district and defer the construction of Molonglo zone substation.
- Advised to proceed with the construction of a single power transformer substation at Molonglo.

2012/13 - completed

- Evaluation of 132kV switchgear technologies for Molonglo zone substation
- Zone substation concept design studies
- Preliminary assessment and negotiation for Zone Substation access roads
- Development of documentation to support the DA
- Draft Regulatory Investment Test (RIT) written

2011/12 - completed

- Development Application (DA) planning

2010/11 - completed

- Project planning
- Negotiations between ActewAGL and the ACT Government for site selection for the proposed Zone Substation.
- Purchase of land for Molonglo zone substation

2009/10 - completed

- Project initiation, planning and feasibility phase

Project Definition

Objectives

The business objective is to maintain a reliable supply of electricity in the Molonglo District. This is achieved by using the existing network infrastructure to supply the Molonglo District in the short term and commissioning a new zone substation in Molonglo when the existing network has reached its full capacity.

Scope

The project scope has been split into the concept design phase and the detailed design, construction and commissioning phase. The concept design phase of this project is managed by the Asset Strategy and Planning Branch and the detailed design, construction and commissioning phase will be managed by the Works Enablement Projects Branch.

Concept Design – Asset Strategy & Planning Branch

The activities that are in scope are:

- Land purchase for new zone substation in Molonglo
- Engagement of consultant to complete concept design and functional specification
- Environmental and geotechnical studies during concept design phase
- Detailed land survey of Zone Substation Site and access route(s)
- Prepare and submit DA with the ACT Government
- Prepare and submit Regulatory Investment Test (RIT)

Detailed Design & Construction – Major Projects Branch

The activities that are in scope are:

- Project Management of detailed design, procurement, construction and commissioning phase.
- Detailed design and construction of the substation access road
- Develop a Target Cost Estimate (TCE) for Molonglo zone substation
- Test the contract price with the open market
- Prepare and submit to ActewAGL's board, the board paper for the approval to complete the detailed design and construct Molonglo zone substation
- Detailed design and construction of Molonglo zone substation
- Procurement of major plant equipment for Molonglo zone substation
- Pre-commissioning and commissioning of Molonglo zone substation
- Asset handover to Asset Strategy and Planning Branch

Exclusions

The following items are excluded from the scope:

- Design and construction of the 11kV distribution network from the Molonglo Zone Substation scope.
- Design and construction of the 11kV distribution network to meet the short term load growth in the Molonglo District.
- Communication infrastructure outside of the Molonglo Zone Substation

Constraints / Assumptions

This project has the following constraints and assumptions:

Constraint / Assumption	Impact
Resources	Development of the concept design and functional specification has been contracted to out to SKM to complete. Purdon associates have also been contracted to prepare the DA submission.
Procurement	The major plant equipment must be procured so that the delivery meets the project schedule.
DA approvals	The ACT government's approval of the DA may impact the project milestones & substation design requirements.
RIT	Delays maybe incurred from feedback received from AEMO or the general public on the proposed substation.

Dependencies / Interfaces

This project will interface with the following projects or stakeholders:

Related Initiative	Description of Impact or Dependency
Contractor Services & Manufactures	The success of this project is dependent on the availability of contractors and manufactures of equipment providing goods and services in agreed timeframes.
ActewAGL Divisions	The following major stakeholders will be consulted including: ActewAGL CEO and Board, Asset Management, Network Services, Asset Strategy and Planning, Major Projects, Service Delivery, Network Operations and the Customer Solutions Branch.
External Stakeholders	The major stakeholders external to ActewAGL throughout the concept design stage of this project include; the ACT Government, National Capital Authority, Land Developers, Consultants, and Customers.

Project Approach

Network Planning

Network planning studies have been undertaken by the Asset Strategy and Planning Branch to propose the most economical and reliable option for the supply of electricity to the Molonglo District. The outcome of this investigation is to meet the short term load growth in the Molonglo District by supplying the load from existing zone substations via 11kV feeders. The benefit of this option is to utilize the existing network infrastructure and defer major capital expenditure for the construction of Molonglo zone substation.

A high level plan to meet the short term load forecast in the Molonglo District is as follows. Three 11kV feeders with available capacity already exist in the vicinity of the Molonglo District and are supplied from Woden zone substation. These are the Cotter 11, Streeton and Hilder feeders. A forth 11kV feeder also suitable to supply the Molonglo District is the Black Mountain feeder supplied form Civic zone substation. For more information on strategy to supply the short term load growth in the Molonglo District refer to the *Assessment of Options to Supply the Molonglo District Report.*

Molonglo zone substation concept design

SKM was engaged to undertake the concept design for Molonglo zone substation. The proposed substation concept design is a 132kV to 11kV substation with 55MVA transformer capacity with N-1 redundancy. The substation has been designed to allow for future expansion of the substation (increase in capacity) while reducing the civil and structure works component included in the initial stage. A high level substation specification for the initial stage is shown below:

- 5 x 132kV switchgear bays (provision for three additional bays)
- 2 x 132kV/11kV 55MVA power transformers (provision for third)
- 2 x neutral earthing transformers (provision for third)
- 2 x 11kV/415V auxiliary transformers
- 2 x 11kV switchboards (provision for third)
- Substation earth works, buildings and civil works for all equipment in stage 1 (provision for future substation expansion)
- Substation security fence
- Substation control, protection and SCADA system
- The substation connects to the existing 132kV subtransmission network via a 'turn in'/'turn out' arrangement on the Bruce to Civic overhead line.

Refer to the substations option report, *'ActewAGL Molonglo Zone Substation Options Development and DA Support'* by SKM for further details.

Revised Molonglo zone substation concept design

In December 2013, ActewAGL proposed to install a single 132kV/11kV power transformer substation and single 11kV switchboard at Molonglo zone substation. The purpose of removing the second 132kV/11kV power transformer and 11kV switchboard is to reduce capital expenditure and further defer capital expenditure for the installation of the second power transformer and switchboard.

Molonglo zone substation does not have N-1 redundancy under this revised concept design. As such, all load connected to Molonglo zone substation will be lost following a single contingency event a Molonglo Zone Substation. Arrangements should be considered to manage this risk and planned outages for substation maintenance if this concept is adopted.

Business Case

Benefits

Tangible Benefits	Value	Assumptions	Realisation Milestone
Construction of Molonglo Zone Substation	New Zone Substation with a single 55MVA power transformer capacity with provision for up to 3 transformers.	DA and all other approvals are successful	Successfully constructed and commissioned zone substation is available for service.
Relieve existing Zone Substations such as Woden Zone from supplying loads in the Molonglo District.	Spare capacity available at Woden Zone.	Molonglo Zone Substation is constructed on time.	11kV Feeder loads switched from Woden to Molonglo Zone.
Intangible Benefits	**Assumptions**		**Realisation Milestone**
Ongoing safe and reliable supply to the ACT.	Molonglo Zone Substation is constructed and in service.		Reliable and safe electricity supply available to the Molonglo District.

Costs

The cost estimate for Molonglo zone substation has been prepared for the single power transformer and single 11kV switchboard solution. The estimate is split into three components. These components are:

- Molonglo zone substation
- Molonglo zone substation access road
- Molonglo zone substation Development Application (DA) lodgement

Molonglo zone substation

The Molonglo zone substation estimate was done by SKM during the concept design stage. This estimate is for the design, construction and commissioning of a 2 x 132kV/11kV power transformer and 2 x 11kV switchboard substation using Mixed Technology Switchgear (MTS) as the preferred 132kV switchgear type.

This estimate has been reviewed for the revised concept design to include only a single 132kV/11kV power transformer and 11kV switchboard substation. The following components have been removed. All components include materials, design, installation and commissioning costs.

- 5 x 132kV switchgear bays
- 1 x 132kV/11kV power transformer
- 1 x neutral earthing transformer
- 1 x 11kV switchboard
- 1 x power transformer screen/blast walls
- 1 x 132kV power transformer circuit cable and terminations
- 1 x 11kV power transformer circuit cable and terminations
- 1 x transformer protection panel

The base value of the revised estimate is $16,810,000. This estimate is class 4 according to SKM's estimate classification guidelines and as such has an accuracy of +-50%. For more information on SKM's estimate classification guidelines see Appendix A of *'ActewAGL Molonglo Zone Substation Options Development and DA Support'*.

The base value does not include ActewAGL's internal project costs. This cost has been added to the estimate at a rate of 15% of the base value estimate.

An allowance has been applied to the total to manage the risk associated with the accuracy of the class 4 estimate. This allowance has been applied at the rate of 20% of the total base value plus ActewAGL internal costs.

The total budgetary estimate for Molonglo zone substation is $23,200,000.

Molonglo zone substation access road

The concept design for the substation access road was developed by Mott McDonalds. The base value for this estimate for the detailed design and construction is $1,102,500.

The base value does not include ActewAGL's internal project costs. This cost has been added to the estimate at a rate of 10% of the base value estimate.

An allowance has been applied to the total to manage the risk associated with the accuracy of the estimate. This allowance has been applied at the rate of 10% of the total base value plus ActewAGL internal costs.

The total budgetary estimate for the access road to Molonglo zone substation is $1,340,000.

Molonglo zone substation DA lodgment and access road concept design/planning
The substation access road concept design has been completed by Mott McDonalds in 2013/14 and stakeholders have been consulted when evaluating the proposed access routes.

The DA submission for Molonglo zone substation is also in progress and is scheduled to be completed in the 2013/14 financial year. The DA submission has been prepared by Purdon Associates in conjunction with ActewAGL.

The total budgetary estimate for these works is $250,000.

The grand total estimate is $24,790,000.

Note the estimate in this brief does not include the following:

1. Molonglo zone substation works completed prior to the 2013/14 financial year. (see project background section for details)
2. Modifications to the existing 132kV subtransmission line other than the 'turn in'/'turn out' arrangement into Molonglo zone substation
3. Single power transformer & single 11kV switchboard solution
4. Communication networks outside of Molonglo zone substation
5. Connection of a fire hydrant system connected to a town water supply
6. Operation and maintenance costs
7. GST
8. Variation of scope

Molonglo zone substation revised concept design budgetary estimate.

Description	TOTAL ($)	2013 / 14	2014 / 15	2015 / 16	2016 / 17	2017/18	2018/19	2019/20
Molonglo Zone Substation								
Substation Design & Construction	16,810,000			3,362,000	8,405,000	5,043,000		
ActewAGL internal costs (15%)	2,521,500			504,300	1,260,750	756,450		
Risk management contingency on estimate accuracy (20%)	3,866,300			773,260	1,933,150	1,159,890		
Sub-total	**23,200,000**			**4,640,000**	**11,600,000**	**6,960,000**		
Substation Access Road								
Access Road Design & Construction	1,102,500	1,102,500						
ActewAGL internal costs (10%)	110,250	110,250						
Risk management contingency on estimate accuracy (10%)	121,275	121,275						
Sub-total	**1,340,000**	**1,340,000**						
Development Application Lodgement								
Development Application Lodgement		**250,000**						
Grand Total	**24,790,000**	**1,590,000**		**4,640,000**	**11,600,000**	**6,960,000**		