



ELECTRICITY NETWORKS
Asset Strategy & Performance
Functional Scope



Executive Summary

Victoria Market (VM) Zone Substation (ZSS) is a fully operational ZSS with three 66/11kV transformers operating on the edge of the CBD. The current asbestos register lists the fire system, cable tunnels, distribution boards, CB arc chutes and expansion joints as containing asbestos. The current PCB register lists Tx No 1, the diverter tank along with the feeder CB's as containing PCB. Taking the above into account, there is the potential for contaminated soil containing asbestos and PCB's at this site.

Project Summary:

Replace the 66/11kV No.1Transformer at Vic Market (VM) Zone substation. The scope of work includes primary and secondary design, associated civil structural footing assessment, modifications to the fire system, procurement of the new transformer, installation and commissioning.

Comments:

Associated Projects:

There are no other known projects associated with this project. Other tasks in the vicinity may be carried out concurrently including repairs and maintenance.

PROJECT REQUIREMENTS

1. Project Objective

Replacing the aged 66/11kV No.1 Transformer at VM Zone substation with CP-2 type power transformer, complying with the CitiPower and Powercor Material and Technical specification for Zone Substation Power Transformers ZD101 version 10.

2. Broad Functional Requirements

Replace existing VM No 1, 20/27MVA Transformer with new 20/27MVA ONAN/ODAN/ODAF(E) transformer - type CP-2 as per ZD101 specification including all relevant primary and secondary electrical works, installation, testing and commissioning to bring the new transformers into service.

The existing transformer protection was recently upgraded so it is not expected to require any significant secondary works or relay replacements.

As part of the design, undertake a civil structural review to confirm the existing footings are suitable for the replacement transformer and any required updates to the fire deluge system.

It is expected no changes are necessary to the current network other than required secondary works to bring the protection schemes up to current relay standard.

3. Detailed Functional Scope of Work

3.1 Primary Plant Required

The 66/11kV transformers at VM ZSS are installed on the ground floor within a multi-floor building on the corner of Dudley and Walsh streets. These transformers are enclosed inside a bunded area with in-ground oil containment drain tanks that holds an approximate volume capacity of 5400 gallons. There are a total of two drain tanks at this substation.

The 66kV lines enter the building via the second floor before terminating on 66kV gas-insulated switchgear. The transformers are supplied from this 66kV switchboard by cables which drop through the floor onto the corresponding transformers. The cables are supported by cable racks and ladders along its route.

The 11kV connection from the transformer traverses through conduit to the cable basement before entering the 11/6.6kV switchroom from below.

This project requires the replacement of the No.1 66/11kV, 20/27 MVA ON/OB Dy1 transformer with a new CP-2 type 66/11kV, 20/27 MVA, ONAN/ODAN/ODAF(E) transformer in accordance with CitiPower's ZD101 specifications. The radiators are to remain attached to the main tank, similar to the current arrangement.

The following detailed design works required are:

- Procure one 20/27 MVA, 66/11kV, ONAN/ODAN/ODAF(E), DYn1 vector grouping with attached radiators.
- Decommission and remove the existing No.1 transformer.
- Assess current bunded enclosure to determine suitability of accommodating the new transformer and provide safe entry and egress.
- Ensure all clearances comply with standards.

- Assess and modify (if required) the overhead 66kV transformer connections to align with the new HV bushings.
- Replace 11kV transformer connections to accommodate new 2x 1000mm² cables to the 11kV CB.
- Assessment of the transformer cable terminations at the 11kV switchboard.
- Assess and modify transformer earthing arrangement as necessary.
- Assess and modify conduits for all cabling from the transformer enclosures to various locations for transformer operation.
- Ensure Factory and Site Acceptance Testing results comply with CitiPower requirements.
- Arrange earth grid testing to ensure existing earth grid is compliant.
- Create/modify associated labels to meet CitiPower standards.
- Prepare ordering documentation for parts and material.
- Provide construction support.
- Provide noise assessment support for sound-proofing (if required).

The design shall confirm the oil volume and ensure appropriate discharge into the existing oil containment system.

Verification of the new conductors and cables are suitably rated for transformer operational capabilities.

Ensure sufficient lighting in accordance with operational health and safety requirements in and around the transformer enclosure.

3.2 Civil Works Required

It is expected existing transformer footings will be suitable for re-use with the new transformer. Design to confirm.

New transformer to be installed considering vibration transmission isolation into the building structure as far as practicable to reduce overall structural noise generation.

The transformer bay fire system detection and deluge equipment will need to be rearranged to suit the configuration of the new transformer and shall be compliant with relevant building fire code regulations.

The bunding system of No.1 transformer bay is to be confirmed suitable for the new transformer. The existing bund wall may need to be removed to facilitate the transformer change however this must be reinstated.

3.3 Switchyard Lighting

Conduct a lighting study in and around the vicinity of the transformer enclosure to assess any impact and update as required.

3.4 Building & Property Considerations

Consider floor loading during works in relation to transformer and accessory movements in and out of the zone substation. Consideration of temporary floor bracing from within the cable basement may be required. Suitable protection of the footpath crossover may also be required.

3.5 Recoveries

All primary and secondary equipment removed from the existing installation shall be assessed for serviceability and adequacy for spares holding requirements. Where equipment is returned to the spare equipment store, it shall be clearly labelled as to where they originated and details regarding its serviceability and condition.



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The existing transformers shall be reviewed and assessed. Where parts such as tap changers, HV bushings, radiators and fans, monitoring devices are determined to be in a serviceable condition and able to be used as spare parts, these shall be retained in the equipment stores. Any unserviceable equipment shall be disposed in the appropriate manner.

As soon as practical after shutdown, the transformers are to be condition assessed by taking oil and paper samples prior to scrapping. This will help establish the internal condition of the transformers with same age, duty and condition for benchmarking purposes on similar transformer in the network.

3.6 Secondary Works Required

General

- Ensure DC battery capacity is appropriate for any new equipment. Calculations to be conducted.
- A protection review shall be carried out, new settings to be applied to all relevant relays and tested into service.
- All protection settings, calculations, setting files, coordination plots are to be attached in PRISM.
- Any modifications made to AC distribution board to be AS3000 compliant.
- A site visit with the RO and a tester is required to determine possible panel location for the new relays prior to DDS development.
- The transformer protection at VM has recently been upgraded and consist of SEL-387E and Siemens 7UT612 for X and Y transformer differential protection respectively.
- Secondary works associated with transformer protection are expected to be limited to establishment of tap changer pressure protection circuit and connection to Gas and Tap Changer 3 position selector switch
- All serviceable secondary equipment removed shall be returned to the Spare Equipment Store and shall be used to boost spare stock levels as required.

Transformer Protection

Transformer No.1 & No.2 Gas and Tap Changer Pressure Protection:

- Establish new Gas and Tap Changer Pressure protection circuitry and connect it to 3 position selector switch
- Install 2-off RMS 3A30-A51 Gas and Tap changer pressure protection relays in Panel 3

Notes:

- No change to parallel control circuitry for OLTC
- Wire in Ref CTs from TX Neutral to diff relays. Reuse existing CTs.

SCADA

- The Control System Pages for WA shall be modified within the existing SCADA system and all new relevant controls, statuses, analogues and alarms are to be remotely monitored via the substation RTU.

Summary of key new equipment

Function	QTY	Existing Relay (Function)	New Relay	SAP ID
No.1 & No. 2 Transformer OLTC Pressure Protection	2	-	RMS 3A30-A51	389301

3.7 Other Work External to the Zone Substation

Nil

4. Environmental Considerations

Oil Containment Risk Assessment is to be conducted as per Powercor Standard SA051 throughout the oil handling processes.

Further consideration to be given regarding the following:

- Visual, noise, vibration, EMF considerations.
- Access, traffic, obstructions and working hours.
- Standard work practices to apply regarding traffic, noise, pollutants, dust, debris, and water run-off and oil containment.

5. Liaison and Coordination of Works

The Project Manager is responsible for:

- Contact with Local Councils, obtaining any permits and approvals etc.
- Community consultations where applicable.
- Road management to apply.
- Communicating project status and issues to the stakeholders and arrange meetings.

6. Known Issues Specific to this Location or Project

Vehicle and heavy load access is restricted around the VM site and may require extended planning time with council and local residents etc.

It is expected that transformer delivery and pickup will require traffic control and partial road closure of Walsh street.

7. Health and Safety Concerns

All H & S issues relating to this project must be as per Citipower & Powercor health & safety standards.

The following should be also considered:

- Non-standard work practices
- Any other matters of importance
- Site inductions and site conditions

8. Test and Commissioning Plans

The project manager shall coordinate and arrange Test and Commissioning Plans:

- Inspection and Test Plans
- Contingency Plans
- Pre-Commissioning Meeting Agendas
- Commissioning Plan

9. Cost Estimate

The estimate based on this scope is **\$3,600,264** in line with the following breakdown.



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Task Name	Description of cost breakdown	Cost (\$ 000)
Project Management		130.1
Initiation and Scope		64.8
Design		
	Design and drawing update labour costs	699.0
	External subcontractor costs for design confirmation (contaminated soil, oil testing, soil resistivity testing)	78.0
Construction		
	Construction management & supervision (on site)	67.1
	Transformer material costs	1,156.1
	Labour costs associated with primary equipment installation	186.9
	— Subcontractor costs for asbestos removal	
	— Transformer bay demolition	
	— Heavy haulage & crane hire to skate transformer into position	
	— Scissor lift, boom lift and smaller on site crane for material handling	413.2
Civil Construction Works		
	Transformer bay construction labour	28.3
	Transformer bay construction subcontractor costs	186.4
Construction Sec/Test/Commission		
	Secondary equipment installation & testing labour costs	366.1
	Material costs for secondary equipment	160.8
Closeout	Project closeout labour costs	63.4



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Total

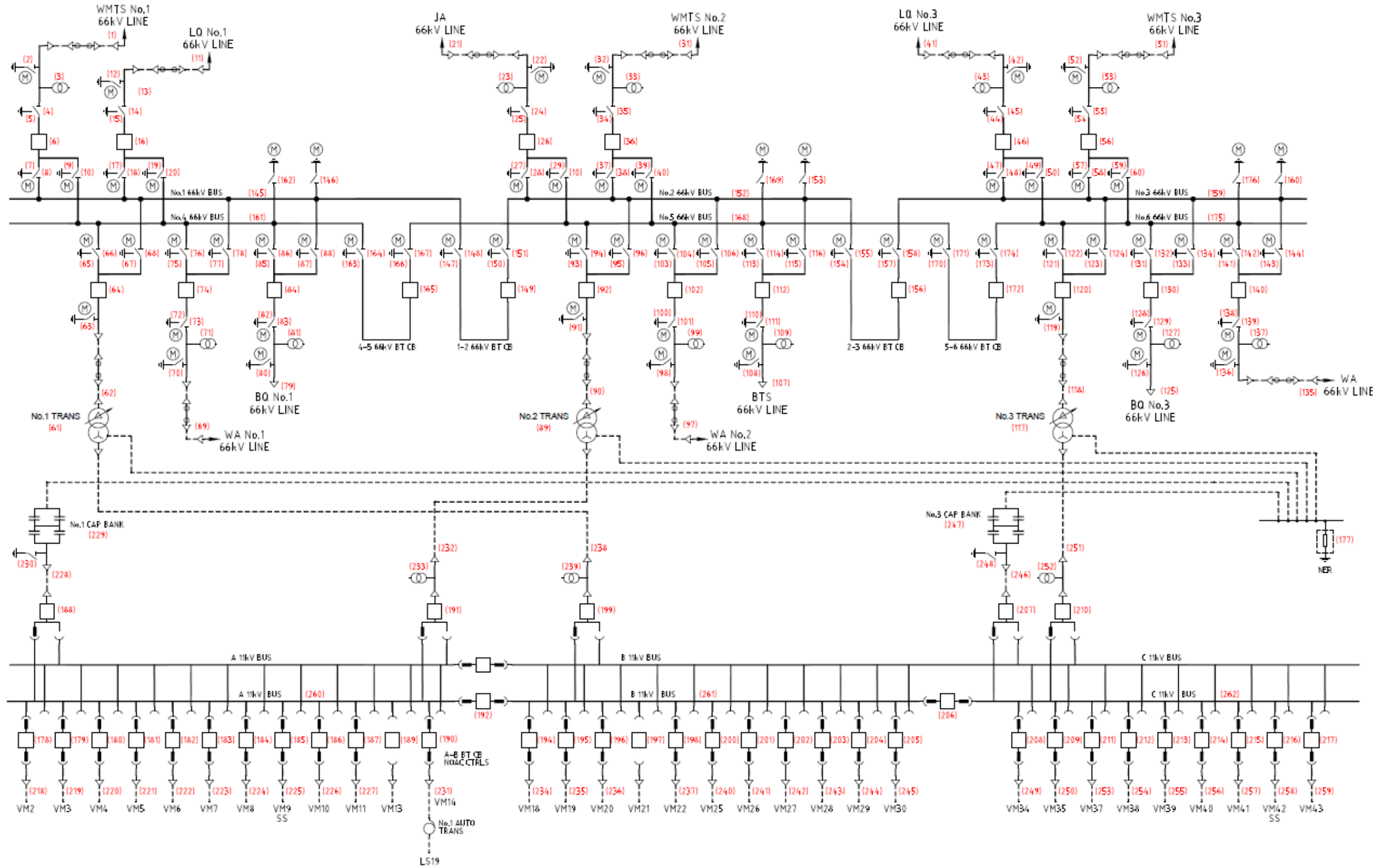
3,600



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Appendix 1 – Current VM Single Line Diagram



Appendix 2 – Current Network diagram for VM

