Schedule

Transmission Operation and Maintenance Schedule

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Authorisations

Action	Name and title	Date
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Reviewed by		
Authorised by	Robert Smith, Secondary Systems Asset Strategy Team Leader	29/06/2018
Review cycle	30 months	

Responsibilities

This document is the responsibility of the Secondary Systems Asset Strategy Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Please contact the Secondary Systems Asset Strategy Team Leader with any queries or suggestions.

- Implementation All TasNetworks staff and contractors.
- Compliance All group managers.

Minimum Requirements

The requirements set out in TasNetworks' documents are minimum requirements that must be complied with by all TasNetworks team members, contractors, and other consultants.

The end user is expected to implement any practices which may not be stated but which can be reasonably regarded as good practices relevant to the objective of this document.

Record of revisions

Section number	Details
1.0	Initial Release

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1 General

1.1. Purpose

The purpose of this document is to outline the Transmission Operation and Maintenance schedule extracted from the appropriate asset management plans. This information is to assist proponents of connects to TasNetworks assets in understanding the planned outages that will occur from time to time in maintaining the network assets

1.2. Scope

The document applies to the Transmission Line and Substation assets only. It outlines only planned activities only and does not include any unplanned outages that may occur on the network.

1.3. References

Information provided in this document is sourced from TasNetworks Asset Management Plans (AMPS)

2. Transmission Line Equipment

2.1. Line Inspection Cycle

Strategy	Frequency	Description
'Detailed methodical' aerial condition assessment	3 year cycle	• A detailed condition assessment is conducted utilising a helicopter (approximately 33 per cent of total structures per year). • Effective for approximately 97 per cent of the transmission line population over the 3 year period. The remainder is subject to a climbing condition assessment.
'Detailed methodical' climbing condition assessment	3 year cycle	• A detailed condition assessment is conducted by climbing individual structures. • Applies to approximately 3 per cent of total structures over the 3 year period. • Only applicable where 'no-fly' areas prevent the use of a helicopter.
Ground-based inspections (non-climbing)	Annually	• A visual inspection aimed at identifying obvious defects that could impair the electrical or structural integrity of the transmission line. • Any defects are reported. • Applies to the structures that did not receive a 'detailed methodical' inspection (i.e. 67 per cent of total structures).
		• Perform thermo graphic surveys on 17 circuits critical
Strategy	**Frequency**	**Description**
Thermographic inspection	5 year cycle	to the operation of Basslink every five years (funded externally).
	As required	• Ad hoc thermo graphic inspections are undertaken where identified (through routine inspections) as being necessary. TasNetworks is currently reviewing whether there is value in establishing a cyclic thermo graphic program for all transmission circuits.
Specialised inspection and test regimes	As required	• If TasNetworks identifies a new or unusual failure mode, then targeted inspection or test regimes may be employed.

2.1. Insulator Inspection Cycle

Strategy	Frequency	Description
'Detailed methodical' aerial condition assessment	3 year cycle	A detailed condition assessment is conducted utilising a helicopter (approximately 33 per cent of total assemblies per year). Effective for approximately 97 per cent of the transmission line population over the 3 year period. The remainder are subject to a climbing condition assessment. Where damaged or corroded insulator assemblies are observed, a defect will be recorded for remedial action.
'Detailed methodical' climbing condition assessment	3 year cycle	A detailed condition assessment is conducted by climbing individual structures. Only applicable where 'no-fly' areas prevent the usage of a helicopter and applies to approximately 3 per cent of total structures over the 3 year period. Where damaged or corroded insulator assemblies are observed, a defect will be recorded for remedial action.
Ground-based inspections (non-climbing)	Annually	Applies to the 66 per cent of total assemblies that did not receive a 'detailed methodical' inspection. A visual inspection aimed at identifying obvious defects that could impair the electrical or structural integrity of the transmission line. Where damaged or corroded insulator assemblies are observed, a defect will be recorded for remedial action.
Porcelain insulator testing	10 year cycle	Testing of porcelain insulators is required once the insulator reaches 20 years of age and then every 10 years thereafter (focusing on critical transmission lines, or insulators known to pose a higher risk to TasNetworks).
Other inspections/tests	As required	Porcelain insulators known to have incurred a lightning strike(s) will be inspected and/or tested to determine if they require replacement. In corrosive atmospheres, leakage tests will be conducted where condition deterioration is forecast or observed to be rapid. Polluted insulators will be washed to prolong life, and defective units will be replaced on an "as required" basis. Where there is a lack of condition information, TasNetworks will remove one or more insulator assemblies from service and perform stress tests to determine the remaining strength in the unit(s).

3. Substation Primary Equipment

3.1. Power Transformer Maintenance Cycle

Task	Frequency
Visual inspections and routine condition monitoring (including oil level indicators)	Coordinated with substation quarterly inspections
Thermal imaging	Coordinated with substation annual thermal imaging program
Manual Insulating oil sampling and analysis (transformer) - in-service units	Prior to energisation for new units 24 hours after transformer has been put on soak 48 hours after transformer has been put on load Thereafter monthly for the first six months following commissioning (only if portable on-line DGA unit not available)
	Every two years or more frequently as determined by condition assessment
On-line Insulating oil sampling and analysis (transformer) - in-service units	Portable DGA unit is to be connected to each new transformer for the first six months following commissioning with alarm points and gas values telemetered back to NOCS.
	Online DGA unit can be connected to in-service units if age and condition assessment warrants real time monitoring.
	Online DGA monitoring devices, where fitted, are to be tested every six years in conjunction with protection routine testing (operational DC checks)
Insulating oil sampling and analysis (tap changer)	Every two years until the age of 35, then more frequently as determined by condition assessment
Tap-changer preventive maintenance resistor type load tap-changers reactor type load tap-changers vacuum type load tap changers	Every six years Every three years 18 years after commissioning and every six year thereafter Maintenance may also be determined by the number of tap operations and tapping range.
Degree of polymerisation (DP)	At midlife if determined necessary by oil analysis and condition assessment criteria As transformer approaches end of life if determined necessary by CBRM and verified by a detailed condition assessment Note: Undertaken only when practical Note: In transformers purchased after 2010 a paper samples has been placed on top of the core accessible from hand hole. If deemed necessary
	overtime then this paper sample could be taken and DP could be analysed.

Transformer and tap changer electrical testing (winding resistance, insulation resistance, ratio, DDF and DIRANA tests.)	At midlife if determined necessary by oil analysis and condition assessment criteria As transformer approaches end of life if determined necessary by CBRM and verified by a detailed condition assessment
Condenser bushings electrical testing (capacitive and power factor tests)	18 years after commissioning and every six years thereafter
Auxiliary equipment Buchholz gas detection relay operation check Pressure relief valve operation check (main tank and OLTC) Oil and winding temperature calibrations (mechanical indicators only) DRMCC or similar (where fitted)	Every six years in conjunction with protection routine testing (operational DC checks)
Cooling system (pumps and fans - functional tests)	Coordinated with substation quarterly inspections

3.2. Circuit Breaker Maintenance Cycle

Task	Frequency (based on medium of Insulation)			
	Vacuum	SF_6	Oil	Air
Visual inspections and routine condition monitoring coordinated with substation inspection program	Quarterly	Quarterly	Quarterly	Quarterly
Electrical testing (insulation resistance, contact resistance, etc.)	18 years after commissioning and every six years thereafter	18 years after commissioning and every six years thereafter	Every 3 years	Every 3 years
Monitoring of SF_6 gas pressure	n/a	Continuously	n/a	n/a
Partial discharge measurements*	Biennially	Biennially	Biennially	Biennially
Online monitoring of circuit breaker fault operations (only modern switchgear)	Continuously	Continuously	Continuously	Continuously

3.3. Gas Insulated Circuit Breaker

Classification	Frequency
Visual Inspection	Quarterly
Major Inspection	Every 20-25 years
Contact System Check	Every 20-25 years or once the maximum allowable number of fault current operations, as detailed below, has been reached

To perform major inspections GIS components are taken out of service either completely or in sections. SF6 gas compartments must be opened.

3.4. Gas Insulated Switchgear (GIS)

Classification	Frequency
Visual Inspection	Yearly
Minor Examination	Every 4-6 years
Major examination	Every 12-18 years or after 3000 operations of the circuit breaker
CB's contacts and driving mechanism examination	Every 5000 operations
Compartments overhauling	Every 15-25 years

3.5. Post Insulator Maintenance Cycle

Task	Frequency
All units	
Visual inspections and routine condition monitoring	Quarterly
Thermal imaging	Coordinated with substation thermal imaging program
Units installed at high pollution sites	
Insulator washing	Every two years

3.6. Current Transformer (CT) Maintenance Cycle

Classification	Frequency
All units	
Visual inspections and routine condition monitoring	Coordinated with substation inspections
Thermal imaging	Coordinated with substation thermal imaging program
Oil-filled current transformers	
Classification	Frequency
Insulating oil sampling and DGA (where practicable)	18 years after commissioning and every six years thereafter
Electrical testing (insulation resistance and power factor) where insulating oil sampling facilities are not available	18 years after commissioning and every six years thereafter
SF6-filled current transformers	
Remote monitoring of SF6 gas pressure	Continuous
Electronic capturing of condition data[#]	In conjunction with thermal imaging

3.7. Voltage Transformer Maintenance Cycle

Task	Frequency
All units	
Visual inspections and routine condition monitoring	Quarterly - coordinated with substation inspections
Thermal imaging	Coordinated with substation thermal imaging program
Electronic capturing of condition data#	In conjunction with thermal imaging
Oil-filled capacitive voltage transformers	
Monitoring of secondary phase voltage balances (to be installed on all new installations)	Continuous
Electrical testing (insulation resistance and power factor)	18 years after commissioning and every six years thereafter
Oil-filled inductive voltage transformers (same for CVCTs)	
Insulating oil sampling and DGA (where practicable)	18 years after commissioning and every six years thereafter
Electrical testing (insulation resistance and power factor) where insulating oil sampling facilities are not available	18 years after commissioning and every six years thereafter
SF6-filled inductive voltage transformers	
Monitoring of SF6 gas pressure	Continuous

3.8. Disconnector Maintenance Cycle

onnector design type	Task	Frequency
	Visual inspections and routine condition monitoring	Coordinated with substation quarterly inspections
	Thermal imaging	Coordinated with substation annual thermal imaging program
	Maintenance (with self-lubricating contacts)	Every 18 years
	Maintenance (without self-lubricating contacts)	Every 12 years[1]

4. Substation Secondary Equipment

4.1. Protection Systems

TasNetworks' policy for routine testing of transmission protection is based on the following criteria:

(a) Schemes with relays that have self-supervision ability are sample tested at eight year intervals instead of the previous six year interval; and

(a) Schemes with relays that do not have self-supervision ability are tested at three year intervals.

4.1. SCADA Systems

Currently no planned maintenance regime exists for SCADA systems, however SCADA systems included as part of anti-islanding and runback schemes will be tested as part of routine protection testing.