Network Standard

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	Amendment No	: 0
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	Approval Date	: 20/04/2015

NW000-S0065 **NS212 INTEGRATED SUPPORT REQUIREMENTS FOR AUSGRID NETWORK ASSETS**

ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the design, review and approval of the creation and modification of network infrastructure; and supervising or carrying out of works associated with those installation, and is for reference by field, technical and engineering staff.

Ausgrid maintains a copy of this and other Network Standards together with updates and amendments on www.ausgrid.com.au.

Where this standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document

DISCLAIMER

As Ausgrid's standards are subject to ongoing review, the information contained in this document may be amended by Ausgrid at any time. It is possible that conflict may exist between standard documents. In this event, the most recent standard shall prevail.

This document has been developed using information available from field and other sources and is suitable for most situations encountered in Ausgrid. Particular conditions, projects or localities may require special or different practices. It is the responsibility of the local manager, supervisor, assured quality contractor and the individuals involved to make sure that a safe system of work is employed and that statutory requirements are met.

Ausgrid disclaims any and all liability to any person or persons for any procedure, process or any other thing done or not done, as a result of this Standard.

All design work, and the associated supply of materials and equipment, must be undertaken in accordance with and consideration of relevant legislative and regulatory requirements, latest revision of Ausgrid's Network Standards and specifications and Australian Standards. Designs submitted shall be declared as fit for purpose. Where the designer wishes to include a variation to a network standard or an alternative material or equipment to that currently approved the designer must obtain authorisation from the Network Standard owner before incorporating a variation to a Network Standard in a design.

External designers including those authorised as Accredited Service Providers will seek approval through the approved process as outlined in NS181 Approval of Materials and Equipment and Network Standard Variations. Seeking approval will ensure Network Standards are appropriately updated and that a consistent interpretation of the legislative framework is employed.

Notes: 1. Compliance with this Network Standard does not automatically satisfy the requirements of a Designer Safety Report. The designer must comply with the provisions of the Workplace Health and Safety Regulation 2011 (NSW - Part 6.2 Duties of designer of structure and person who commissions construction work) which requires the designer to provide a written safety report to the person who commissioned the design. This report must be provided to Ausgrid in all instances, including where the design was commissioned by or on behalf of a person who proposes to connect premises to Ausgrid's network, and will form part of the Designer Safety Report which must also be presented to Ausgrid. Further information is provided in Network Standard (NS) 212 Integrated Support Requirements for Ausgrid Network Assets.

2. Where the procedural requirements of this document conflict with contestable project procedures, the contestable project procedures shall take precedent for the whole project or part thereof which is classified as contestable. Any external contact with Ausgrid for contestable works projects is to be made via the Ausgrid officer responsible for facilitating the contestable project. The Contestable Ausgrid officer will liaise with Ausgrid internal departments and specialists as necessary to fulfil the requirements of this standard. All other technical aspects of this document which are not procedural in nature shall apply to contestable works projects.

INTERPRETATION

In the event that any user of this Standard considers that any of its provisions is uncertain, ambiguous or otherwise in need of interpretation, the user should request Ausgrid to clarify the provision. Ausgrid's interpretation shall then apply as though it was included in the Standard, and is final and binding. No correspondence will be entered into with any person disputing the meaning of the provision published in the Standard or the accuracy of Ausgrid's interpretation.

KEYPOINTS

This standard has a summary of content labelled "KEYPOINTS FOR THIS STANDARD". The inclusion or omission of items in this summary does not signify any specific importance or criticality to the items described. It is meant to simply provide the reader with a quick assessment of some of the major issues addressed by the standard. To fully appreciate the content and the requirements of the standard it must be read in its entirety.

AMENDMENTS TO THIS STANDARD

Where there are changes to this standard from the previously approved version, any previous shading is removed and the newly affected paragraphs are shaded with a grey background. Where the document changes exceed 25% of the document content, any grey background in the document is to be removed and the following words should be shown below the title block on the right hand side of the page in bold and italic, for example, Supersedes – document details (for example, "Supersedes Document Type (Category) Document No. Amendment No.").

KEY POINTS OF THIS STANDARD

Scope and Risks Addressed

This standard is limited to scope identified below and provides controls for associated risks as listed below:

- ☐ The requirements of this network standard apply when a new piece of equipment is purchased for use in the Ausgrid Subtransmission and distribution networks.
- ☐ Requirements for maintenance plans, equipment manuals and training requirements may be waived if the required documentation/training already exists for identical equipment previously procured.
- ☐ A spare parts assessment is required where there is an increase in the in-service population of the equipment on the network.
- ☐ Requirements of the Work Health and Safety Act 2011 are reviewed in relation to the duties of the designer, manufacturer or supplier of any plant or substance for use by people at work.

Where to for more information?

Section 1, 2, 6

Integrated Support Requirements

This section identifies requirements to operate and maintain the plant/equipment throughout its operation life and includes:

- ☐ Maintenance requirements
- ☐ Spares support
- ☐ Equipment manuals
- ☐ Training
- ☐ Support equipment and tooling

Where to for more information?

Section 7

Tools and Forms

Annexure A, B, C
Annexure D Sample compliance checklist

Network Standard
NS212
Integrated Support Requirements for Ausgrid Network Assets

Contents

1.0 PURPOSE

This document details the requirements for determining and delivery of integrated support requirements of major electrical equipment in the Ausgrid sub-transmission and distribution networks. It is designed to be used in conjunction with Ausgrid Network Standards for purchase specifications for individual electrical equipment or complete installations (substations) and contains information to facilitate the support of the Ausgrid asset management systems including maintenance management, configuration management, quality management, risk management and financial processes.

To achieve best practice Ausgrid is continually developing its asset support requirements related to its business objectives. This document will aid in the provision of information required to determine the full life cycle cost of network assets through the acquisition, operational and disposal phases.

2.0 SCOPE

The requirements of this document apply when a new piece of major electrical equipment is procured for use in the Ausgrid sub-transmission or distribution Networks in conjunction with the relevant Ausgrid standard for the equipment. Ausgrid will waive these requirements for maintenance plans, equipment manuals and training requirement where this support documentation is already held for identical equipment which has been previously procured. The requirement for spare parts assessment is mandatory where the procurement will increase the in-service population of the equipment on the Network.

3.0 REFERENCES

3.1 General

All work covered in this document shall conform to all relevant Legislation, Standards, Codes of Practice and Network Standards. Current Network Standards are available on Ausgrid's Internet site at www.ausgrid.com.au.

3.2 Ausgrid documents

- Bush Fire Risk Management Plan
- Company Form (Governance) - Network Document Endorsement and Approval
- Company Procedure (Governance) - Network Document Endorsement and Approval
- Company Procedure (Network) - Production / Review of Network Standards
- Customer Installation Safety Plan
- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- Maintenance Requirements Analysis Manual (MRAM)
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- Public Electrical Safety Awareness Plan
- Public Lighting Management Plan
- Tree Safety Management Plan

3.3 Other standards and documents

- ENA Doc 001-2008 National Electricity Network Safety Code

3.4 Acts and regulations

- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014

- Work Health and Safety Act 2011 and Regulation 2011

4.0 DEFINITIONS

Accredited Service Provider (ASP)	An individual or entity accredited by the NSW Government Trade & Investment in accordance with the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW).
Business Management System (BMS)	An Ausgrid internal integrated policy and procedure framework that contains the approved version of documents.
Consumable items	Non repairable components which are damaged or wear due to use and are replaced with new components when necessary or when predetermined wear limits are reached, (e.g. items such as contacts, lubricants, etc).
Document control	Ausgrid employees who work with printed copies of document must check the BMS regularly to monitor version control. Documents are considered "UNCONTROLLED IF PRINTED", as indicated in the footer.
Emergency spares (insurance spares)	Equipment components purchased and stored as replacement components for use in repairing the systems to serviceable condition subsequent to the occurrence of a major incident that causes major damages to the primary item requiring a major part or all of the equipment to be replaced, or secondary damage, such as damage to adjacent equipment. Emergency (Insurance) spares are normally equipment / components that are susceptible to sustaining damage beyond economical repair if involved in an incident, have excessive lead times for replacement, but are required to restore the network to service.
Failure Modes Effects and criticality Analysis (FMECA)	The structured analysis process where the functions, failure modes, cause, failure effect are identified and analysed. The criticalities are identified in terms of Hidden/Evident failure, Safety, Environmental and operational impacts.
Maintenance requirements analysis (MRA)	The process of determining the range of tasks in the maintenance schedules that will preserve the inherent levels of safety and reliability of the design and which provide an effective and efficient means of keeping the equipment in the condition required.
Network Standard	A document, including Network Planning Standards, that describes the Company's minimum requirements for planning, design, construction, maintenance, technical specification, environmental, property and metering activities on the distribution and transmission network. These documents are stored in the Network Category of the BMS repository.
Original Equipment Manufacturer (OEM)	The original supplier/manufacturer of the equipment.
Repairable items	Equipment components which may be removed from their operating positions for maintenance, restored to a predetermined serviceable condition and reinstalled for a further use, such as switchgear bushings, etc.
Review date	The review date displayed in the header of the document is the future date for review of a document. The default period is three years from the date of approval. However a review may be mandated at any time where a need is identified due to changes in legislation, organisational changes,

	restructures, occurrence of an incident or changes in technology or work practice.
Rotable items	Major equipment / components that may be removed from their operating positions for scheduled maintenance and subsequently reinstalled or replaced with serviceable components.

5.0 AUSGRID HEALTH AND SAFETY POLICY

Be Safe
Statement of Commitment

Ausgrid | Be Safe Stop. Think. Do.

Our objectives

Ausgrid is committed to achieving a zero harm workplace. The WHS Policy has been developed to support Ausgrid's responsibility to:

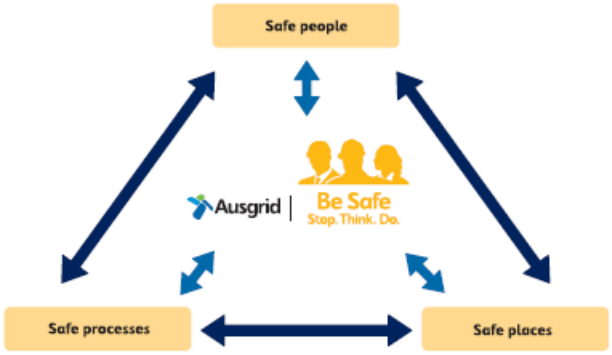
- oversee the implementation and effectiveness of the company's WHS Management System;
- review the appropriateness of WHS risk management and risk monitoring processes and programs as they are developed, implemented and maintained; and
- establish a WHS Management System to facilitate compliance with relevant laws and regulations and continuous improvement in the organisation's performance of its WHS responsibilities.

Our commitment

Reflecting our collective commitment to work health and safety, Ausgrid will use their best efforts to:

- continually improve the WHS Management System;
- manage health and safety risks effectively;
- support our people and improve our work culture;
- consult and communicate with workers and other duty holders about WHS issues;
- improve our working environment;
- not accept reckless acts;
- implement effective rehabilitation and injury management processes; and
- document policies and procedures.

For more information, please refer to the Ausgrid WHS Policy located on The Wire.



Executive Leadership Team

Vince Graham
Chief Executive Officer

Trevor Armstrong
Chief Operating Officer

Pamela Henderson
Chief Engineer

Joe Pizzinga
General Manager – Finance & Compliance

Peter York
General Manager – Health, Safety & Environment

Brett Hooper
General Manager – Network Development

David Pengilly
General Manager – Network Operations

Michael McHugh
Act General Manager – People & Services

Sharron Kennedy
General Manager – Information Communication & Technology

6.0 WORK HEALTH AND SAFETY ACT 2011

The NSW Work Health and Safety Act 2011 provides that a person who designs, manufacturers or supplies any plant or substance for use by people at work must;

(a) ensure that the plant or substance is safe and without risks to health when properly used, and

(b) provide, or arrange for the provision of, adequate information about the plant or substance to the persons to whom it is supplied to ensure its safe use.

The duties under this section:

(a) apply only if the plant or substance is designed, manufactured or supplied in the course of a trade, business or other undertaking (whether for profit or not), and

(b) apply whether or not the plant or substance is exclusively designed, manufactured or supplied for use by people at work, and

(c) extend to the design, manufacture or supply of components for, or accessories to, any plant for use by people at work, and

(d) extend to the supply of the plant or substance by way of sale, transfer, lease or hire and whether as principal or agent, and

(e) extend to the supply of the plant or substance to a person for the purpose of supply to others, and

(f) do not apply to a person merely because the person supplies the plant or substance in the course of a business of financing the acquisition of the plant or substance by a customer from another person.

In this section, "manufacture" plant includes assemble, install or erect plant.

All designs must comply with the requirements of the Work Health and Safety Act 2011 (NSW) and the Work Health and Safety Regulation 2011 (NSW). Ausgrid considers that electricity networks consist of both plant and structures and it requires designers to observe the provisions of the legislation that relate to both.

The designer must give adequate information to each person who is provided with the design plan for the purpose of giving effect to it. The information must include:

- each purpose for which the plant, substance or structure was designed.
- the results of any calculations, analysis, testing or examination.
- any precautions necessary to ensure that the plant, substance or structure is without risks to health and safety when used for a purpose for which it was designed or when carrying out any activity related to it, such as construction, maintenance and demolition.

In this context, Ausgrid requires the designer to provide adequate information regarding any plant, substance or structure associated with the design of any network asset, including overhead or underground distribution mains, overhead or underground subtransmission mains, distribution substations, major substations, street lighting, etc. In so doing, the designer must:

(a) Identify hazards that may arise in the application of the design.

(b) Assess the risks to health and safety arising from each hazard.

(c) To the extent possible, eliminate or minimise all risks that may arise during the design development process by designing suitable control measures.

(d) Review the control measures as required and control any residual risks. Provide each person who receives the design all necessary information regarding the safe use of the plant, substance or structure, including the information required by Items (a) to (c) above.

(e) Provide a Designer Safety Report that identifies any unusual or atypical features of the design and all hazards and risks that are unique to the particular design.

(f) Include in the Designer Safety Report an assessment of risks arising throughout the all construction, operation and maintenance phases of all components of the design plan.

(g) Include in the Designer Safety Report appropriate information on the identified hazards, assessment of risks, adopted control measures and the residual risks of all plant and structure comprising the design plan.

The designer must comply with the provisions of the WHS Regulation 2011 (NSW - Part 6.2 Duties of designer of structure and person who commissions construction work) which requires the designer to provide a written safety report to the person who commissioned the design. This report must be provided to Ausgrid in all instances, including where the design was commissioned by or on behalf of a person who proposes to connect premises to Ausgrid's network, and will form part of the Designer Safety Report.

The Designer Safety Report must be prepared and presented to Ausgrid when the design development process is complete. It must identify all hazards relating to the design that create a risk to the health or safety of persons who will carry out any activity on the plant, substance or structure, and are unique the particular design. This ensures that the risks posed will be properly accounted for by persons constructing or using the designed assets, even though they do not usually arise in relation to similar assets.

In complying with Ausgrid's requirements set out in this Standard, designers must rely on their own understanding of the requirements imposed on designers by the WHS legislation, not on any reference to it by Ausgrid in this Standard or elsewhere.

7.0 INTEGRATED SUPPORT REQUIREMENTS

7.1 General

The information required to operate and maintain the equipment throughout the operational life, in a cost effective manner and to a level of Safety and Reliability that is consistent with the planned operational performance and usage of the systems shall be developed and provided.

This includes:

- Maintenance Requirements
- Spares Support
- Equipment Manuals
- Training, and
- Support Equipment and Tooling

7.2 Maintenance requirements

7.2.1 Planned maintenance

The planned maintenance requirements for the equipment shall be developed and provided.

The identified requirements shall as a minimum include the following, to the extent applicable to the design:

- Operating procedures.
- Preventive maintenance plans and maintenance standards, including service/lubrication tasks, condition monitoring requirements, scheduled restore/discard tasks, failure finding testing and any other tasks considered appropriate for all installed systems and equipment.
- Recommended overhaul requirements, including the recommended overhaul interval and location (onsite/depot/service centre).
- Details of any items or components of the equipment which are subject to hard finite replacement or inspection lives, including structural inspections where applicable.

Maintenance checklists and detailed procedures necessary to carry out the above tasks shall be defined and included in the equipment manual. The maintenance checklists and procedures shall include information on consumable items used as part of the task and reference to any special tools, or equipment needed to perform the task as well as any special skills and/or training necessary for the task.

The recommended maintenance requirements established as a result of this activity shall be documented in the form of a Technical Maintenance Plan and included in the equipment Manual. A Sample TMP is provided in Annexure A, and a template for the provision of the equipment TMP is provided in Annexure B

7.2.2 Maintenance requirements analysis (MRA)

The MRA process shall be undertaken in accordance with the Ausgrid Maintenance Requirements Analysis Manual, which is based upon a Failure Modes, Effects and Criticality Analysis (FMECA) and Reliability Centred Maintenance (RCM) methodology. (see below)

The results of the MRA shall be documented and supplied using the templates shown in Annexure B. The Work Health and Safety (WH&S) implications resulting from the MRA shall also be analysed and documented prior to completion of the respective sets of Maintenance Standards / Service Schedules. Any necessary warnings and cautions shall be incorporated in the Equipment Manual.

The analysis and documentation shall be undertaken using either the OEM's in-house software tools, or the templates provided in Annexure B. Where in-house tools are used both hard and

electronic copy of the analysis shall be provided in an agreed format to allow transfer of the information into the Ausgrid's asset and maintenance systems.

7.2.3 Failure modes, effects and criticality analysis (FMECA)

A Failure Modes, Effects and Criticality Analysis (FMECA) shall be completed, documented and supplied as part of the MRA. The FMECA serves to identify potential failure modes that must be considered as part of the safety and reliability for the equipment. The FMECA also provides the basis for development of planned maintenance requirements and for identifying failure modes and effects for consideration as part of the Safety program.

The FMECA will be conducted down to the Lowest Replaceable Unit level, and shall be completed and documented to either:

- Ausgrid's requirements as specified in the Maintenance Requirements Analysis Manual, or
- the OEM's standard, provided that the approach meets the basic objectives set out within the potential Failure Mode and Effect Analysis Handbook, which forms part of the set of documentation for the QS 9000 supplement to QS 9000 Quality Systems. The FMECA shall be documented using the OEM's FMECA software tool.

The purpose of the FMECA is to review and analyse the equipment's design to establish:

- Potential or demonstrated failure modes for each significant item within the design. This will be carried out at the replaceable subassembly level.
- The likelihood of failure for each identified failure mode, including the failure mode frequency expressed as an individual MTBF or as a percentage of the total equipment MTBF.
- The effect of failure in terms of the impact on safety, environmental impact, operating performance and economic consequences, including secondary damage to both the equipment itself and adjacent equipment.
- The operational criticality of failure in terms of operation of the system, that is, whether electrical supply can continue to be supplied after the failure has occurred.

The FMECA shall be supplied separately to the operations and maintenance manuals, and shall be delivered for Approval by Ausgrid's Maintenance & Replacement Planning Branch prior to the first delivery of the equipment under the procurement contract.

7.2.4 Technical maintenance plan (TMP)

The recommendations resulting from the maintenance analysis process shall be documented in the form of a Technical Maintenance Plan (TMP) for the system using the Ausgrid Maintenance Standards and TMP Templates provided in Annexure B.

The TMP shall include details of:

- the equipment,
- all planned maintenance activities for the equipment, and
- the period at which each maintenance standard (or service schedule) should be performed, and
- Recommended location at which the schedule is to be completed eg onsite, depot, manufacture site, etc.

The Maintenance Standards (service schedules) identified in the NTMP shall contain:

- A logically sequenced list of tasks to be performed, including a reference to the applicable section of the equipment manual containing detailed procedures or necessary technical data required for completion of the task,
- Details of special tools or equipment necessary for completion of the schedule,

- Checklists for recording the results of the maintenance processes.

The terminology used in the service schedule tasks shall be in accordance with section 4.3.6 of the Ausgrid Maintenance Requirements Analysis Manual. (refer to Annexure C)

7.3 Spares support

7.3.1 General requirement

A recommended spares list shall be developed and provided. The recommended spares list must define the recommended range and quantity of rotable and repairable items, consumables and insurance spares to support the planned operational usage of the volume of equipment being procured within the recommended maintenance policies developed in 7.2. Where the procured equipment includes software (ie SCADA systems, protection relays, PLC etc) which is essential for the operation of the equipment's intended functions, the spares list shall include spare software/firmware.

The recommended spares list complete with the information described in 7.3.3 shall be supplied for review by Ausgrid's Spares Engineer - Maintenance & Replacement Planning Branch prior to the first delivery of the equipment under the procurement contract.

Provision of all packaging, storage and handling requirements to ensure the integrity of all spares purchased is to be provided.

7.3.2 Spares assessment methodology

The need for spare parts shall be assessed and the spare parts list developed using a clearly defined methodology.

The methodology shall use established equipment/component failure rates and the related maintenance policies to identify the range and quantity of spares required at any time to maintain the equipment and ensure they meet the availability requirements. The need for insurance spares to meet major unplanned failure events shall be addressed, and a separate assessment process used to identify, quantify and list these insurance spares.

The methodology to be used for the assessment of spares requirements must be included with the Recommended Spares List provided to Ausgrid.

7.3.3 Recommended spares list

The recommended spares list shall be provided for the volume of equipment being purchased in the Tender specification.

The recommended spares list shall include the following information:

- the item identification (name, manufacturers part or reference number and specification, as appropriate to uniquely identify the item);
- the supply source for the item;
- the number of items installed in the equipment population being procured
- the recommended spares quantities to be held for each item;
- the expected price;
- the procurement lead time;
- the item failure rate;
- the predicted usage rate and whether the item is consumable, used in support of planned preventative maintenance or an emergency spare; and
- the probability of the required item being available when the recommended spares quantity is held by Ausgrid.

7.4 Equipment manuals

7.4.1 General

An Equipment Manual shall be provided for the equipment, and shall meet the minimum requirements below. The manual shall be delivered in both hard copy and in electronic formats.

Equipment Manuals shall be provided and be written in clear, concise English. Manuals may supplied as standard manuals in the OEM's proprietary format, provided that the information required in 7.4.2 below is clearly contained within the manuals, and any additional information required is attached. Where the OEM's proprietary manuals contain information and references to multiple models of equipment, information relating to unsupplied equipment shall be clearly crossed or blanked out.

Equipment manuals shall be delivered with the associated equipment delivery.

7.4.2 Content of equipment manuals

Equipment manual(s) shall be provided setting out the recommended procedures for installation, operation and maintenance. These manuals shall include sections clearly describing;

Equipment eescription and specification

The Equipment Description Section shall include the specification and description of each plant and equipment item and associated system.

Assembly, installation and commissioning

The Assembly Section shall include step-by-step procedures for the unloading, unpacking, transport, handling, assembly, erection, adjusting, alignment, preparation for service and testing of all plant and equipment.

Operation

The Operation section of the equipment manual shall describe in detail the procedures for the putting into service, setting and adjusting, checking before and during operation, routine testing and operation of the plant and equipment supplied. Details of any emergency operating procedures shall also be clearly and separately identified in the equipment manual.

It shall provide full information on all operating limitations (temperature, pressure or flow) allowable rates of change of temperature and pressure, allowable temperature differentials, purity requirements for fluids, and any other information required by operating staff to ensure the safe and efficient operation of the plant and equipment.

Maintenance

The Maintenance Section shall include a clearly documented maintenance plan as developed under Clause 7.2, including frequency of inspection of the required Maintenance Standards / Service Schedules The documented maintenance procedures shall contain sufficient detail to enable Ausgrid personnel to undertake both the planned maintenance tasks, including routine / diagnostic testing, condition monitoring tasks and overhaul tasks, and any corrective maintenance tasks require to retain or restore the equipment to a serviceable condition. Where dismantling, reassembly, alignment, replacement or adjustment of components of the equipment is required step-by-step procedures including clear pictorial representation of such operations shall be included.

The corrective maintenance section of the equipment manual shall include guidance in locating and rectifying faults and.

Where the Maintenance Standards / Service Schedules require lubrication activities to be undertaken, the equipment manual shall include clearly labelled photographs or diagrams identifying the lubrication locations, and recommended type of lubricants.

This Maintenance Section shall also include applicable standards of workmanship, tolerances, air gaps, electrical resistance values, limits of wear, periodic adjustments, material specifications including special procedures (eg, heat treatment), and tightening torque values for bolts.

Inclusion of drawings and photographs

Figures and/or pictures should be included where appropriate to complement the equipment manual text. They shall be used to present information difficult to describe by text alone or to provide identification of tools, parts etc;

Halftone figures / photographs where used, shall be suitable for electronic scanning and photocopying without loss of detail.

Warnings and cautions

Where it is essential for the protection of the staff and / or equipment the manuals shall include the appropriate Warnings, Cautions and notes. The contents of a warning shall not be split over two pages. Where the warning or caution contains more than one critical element, those elements should be separated by the use of bullet points for each separate element.

Warnings shall be used for the protection of staff, Cautions used for the protection of the equipment, and Notes used to draw attention special requirements. Where a combination of a warning, caution or note appear together they shall appear in the order of Warning, Caution then Note as applicable.

Reference materials

A copy of all other available reference materials shall be included in the Equipment Manual;

- Original manufacturer and supplier literature and manuals;
- Factory type and routine test reports for all plant and equipment;
- Site test reports covering functional and electrical testing of all plant and equipment;
- Reports of site pre-commissioning tests;
- Setting sheets and logic diagrams for control and protection equipment;
- Complete list of parts;
- List of recommended spare parts to be held in stock (Ref 7.3.3); and
- Procedure for ordering spare parts.

Electronic file format

The preferred file format for the delivery of electronic version of the equipment manual is as a PDF.

- PDF File(s) should have all headings in the table of contents down to level 3 headings linked to the appropriate page/section in the pdf file(s). The PDF files shall also include pdf versions of OEM information, Works/Test certificates and other hardcopy documents to produce a pdf version of the entire manual. Clear scanned images incorporated into pdf files are acceptable. When the pdf files are generated they shall not be password protected, and shall be enabled for editing and annotations.

- Approved equivalent appropriate industry standard software as may be may be considered as an alternative at the time of delivery of this documentation.

7.5 Training requirements

As part of the Integrated Support Requirements for the ongoing utilisation of the equipment, training in the operation and maintenance shall be provided, as well as the provision of training materials to allow Ausgrid to deliver similar training in the future during the life of the equipment.

The training program implementation must, in consultation with the Ausgrid's Representative:

- develop and establish specific training objectives and training methods for each training course for the operation and maintenance personnel nominated by Ausgrid;
- develop, produce and provide training documentation, aids and material for supporting the training;
- prepare and provide a training syllabus, course outlines, training notes, content plans and other material in the form of a training manual, meeting the training course objectives developed above;
- cover both operations and maintenance requirements; and
- provide training for the Ausgrid's nominees, to enable them to conduct future training for other personnel in the operation and maintenance of the equipment.

Personnel nominated by Ausgrid for training will be appropriately qualified to receive the specialised training required on the relevant equipment and ancillary systems.

All training shall be conducted by persons who are appropriately skilled, qualified, experienced and competent in the field involved, and who have completed formal training in instruction techniques.

7.5.1 Operations training

The operations training program shall cover and address operations training for electrical operators who will be required to operate, isolate and earth electrical equipment:

Electrical operators nominated for initial training will be qualified under the Ausgrid Safety Rules and will be experienced in the operation of existing electrical High and Low voltage infrastructure that is part of the Ausgrid network.

The training shall include the:

- theory and practice of the operation of the equipment and its constituent parts and systems;
- controls and instruments;
- safety and emergency operations; and
- techniques for checking, testing and adjusting systems.

7.5.2 Maintenance training

Specific maintenance training shall be included for personnel responsible for routine examination, condition monitoring, servicing, testing; repair and specialist processes such as on site fault finding, removal and replacement, functional or operational testing to a level necessary to support the equipment's operation in the Network.

Maintenance training shall include familiarisation with the equipment, and the specific maintenance requirements for all equipment and ancillary equipment arrangements.

Maintenance training shall also cover the engineering management of the systems for engineering staff.

7.6 Special tools and equipment

Where the installation, commissioning, maintenance or repair of the equipment requires the use of any special tools, test equipment, jigs, or gauges a list of these items shall be provided. Where software / firmware is required for diagnosis, configuring or updating the equipment or it's

associated firmware, this special tools and equipment list shall include details of the any compilers or ancillary software required..

The list of special tools/gauges and equipment provided shall include for each item:

- the recommended number of each special tool, gauge or equipment required based upon the procurement volume,
- the purpose of the item;
- the tasks for which the item is required,
- the details of, and a specification for, each item;
- the maintenance, and any special storage / calibration requirements for each item,
- the recommended supplier;
- the price, and
- the delivery time

8.0 RECORDKEEPING

The table below identifies the types of records relating to the process, their storage location and retention period.

Table 1 – Recordkeeping

Type of Record	Storage Location	Retention Period*
Approved copy of the network standard	BMS Network sub process Standard – Company	Unlimited
Draft Copies of the network standard during amendment/creation	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/106)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/106)	Unlimited

* The following retention periods are subject to change eg if the records are required for legal matters or legislative changes. Before disposal, retention periods should be checked and authorised by the Records Manager.

9.0 AUTHORITIES AND RESPONSIBILITIES

For this network standard the authorities and responsibilities of Ausgrid employees and managers in relation to content, management and document control of this network standard can be obtained from the Company Procedure (Network) – Production/Review of Network Standards. The responsibilities of persons for the design or construction work detailed in this network standard are identified throughout this standard in the context of the requirements to which they apply.

10.0 DOCUMENT CONTROL

Content Coordinator : Maintenance Engineering Manager

Distribution Coordinator : Engineering Information and Services Manager

Annexure A – Sample TMP and FMECA documents

A1 Sample TMP sheet

TMC code				NAME	MANUFACTURER	REFERENCE	ON SYSTEM MAINTENANCE					PUBLICATION
1	2	3	4				Mtce Standard	Period	Latitude	Op count	Latitude	REFERENCE
SW	04	00	00	ACCB, VACUUM, OUTDOOR								
SW	04	02	00	ABB, R-MAG, 27kV, 2000A								
					ABB	R-MAG	SW0403	3Y	3M			
							SW0404	12Y	1Y			
							SW0405	20Y	1Y			

A2 Sample FMECA sheet

Item / Assy Name	11kV Ring Main Unit			Analysts	Crit - Criticality	
				R Biggs	H - Hidden	
Part No / Drg No	Manufacturer DWGs A3-069048.01, A3-069048.10, A3-069049.01				S - Safety, E - Environ.	
Functional Description	1. to distribute electricity				O - Operational	
	2. provide protection against the designated faults for down stream devices				Task Type	
	3. provide inut/output isolators and earthing				P -Preventative	
	4. provide capability to rack in/out circuit breaker				S -Surveillance	
MTBF (hrs)	350400				C - Corrective	

Function #	Parts and Components	Failure Mode	Cause Of Failure	Local Effect	%	Failure Rate	Crit	Tasks	Type	Period	Latitude
1,2	Mechanism and Drive Linkage	1. Mechanical Failure	1. Designated number of operations exceeded	RMU will not operated	10 %	2.8539E-07	O	1. Replace worn component or Mechanism	C	AR	
								2. Check operation of mechanism and indicators.	S	2 yrs	
			2. Damaged springs	RMU will not operate	5%	1.4269E-07	O	1. Check for damaged springs or other components	S	2 yrs	
			3. Sticking / Seized mechanism	RMU will not operate	10 %	2.8539E-07	O	1. Lubricate pins and sliding surfaces	P	2yrs	
1,2	Vacuum Interrupter	1. Flashover	1. Loss of Vacuum	RMU Damaged	5%	1.4269E-07	O	1. Check Vacuum integrity by applying 20kV rms for 1 min.	S	4 yrs	
			2. Electrical Contact Wear	1. Protection Operates	5%	1.4269E-07	O	1. Lubricate moving electrode with Shell Alvania R3 grease.	P	4 yrs	
				2. RMU Damaged							
								2. Check snatch-gap is > 1mm in closed position.	S	4 yrs	

Function #	Parts and Components	Failure Mode	Cause of Failure	Local Effect	%	Failure Rate	Crit	Tasks	Type	Period	Latitude
3,4	Isolating Contacts	Arcing	Dry/contaminated contacts	1. Protection Operates	5%	1.4269E-07	O	1. Clean and lubricate Primary and secondary isolating contacts with thin flim of MS4 Silicon Grease	P	4 yrs	
				2. RMU Damaged							
1	Insulation	1. Arcing / Flashover	Foreign object (Phase/phase,	1. Protection operates	5%	1.4269E-07	O	1. Remove dust from mechanism, interrupter and insulation	P	2yrs	
			phase/earth)	2. RMU Damaged							
								2. Check insulation resistance >100Mohms using 1000V Megger	S	4 yrs	
								3. Replace damage components	C	AR	
2	Control Circuits	1. Fails to open/close	1. Loose terminal	1. Unable to activate circuit breaker control	25 %	7.1347E-07	O	1. Check Terminal tightness	S	2 yrs	
			2. Corroded Terminal					2. Check for corroded terminals	S	2 yrs	
			3. Low Trip voltage					3. Check Trip voltage (>70%V)	S	4 yrs	
			4. Low Close voltage					4. Check Close Voltage (>85%V)	S	4 yrs	
			5. Damaged wiring / coils					5. Check for damaged parts	S	2 yrs	
								6. Check for free movement and settings of trip and spring release coil	S	2 yrs	
4	Switch carriage	1. Jammed/sticking interlock	Sticking interlock	1. Unable to close breaker	10 %	2.8539E-07	O	1. Lubricate Interlocks	P	2 yrs	
		2. Difficult to move CB unit	Jammed/sticking wheel	1. Difficult to withdrawn or return Circuit Breaker	20 %	5.7078E-07	E	1. Lubricate wheels	P	2 yrs	

Annexure B – TMP and FMECA Templates

TMP and FMECA templates will be provided to the successful tenderer in MS Excel format. Instructional notes for use of the FMECA template are included below.

Heading	Required worksheet information
Item/Assemby and Part No/Drg No.	**Identify** the asset, manufacturer's part identification, and drawing details
Analysts	**Identify** the analyst(s) who prepared the FMECA, including contact details.
Functional description.	**Provide** an overview description of the asset's function
MTBF (hrs)	Enter the asset/item's **M**ean **T**ime **B**etween **F**ailure in hours
Function	**Principal functions** - which represent the business reason for an assets existence. Enter the item name and, as concisely as possible, the function(s) of the item to meet the design intent. Functions may also be identified in the form of a desired standard of performance with functional failure deemed to have occurred when this level of performance is not available. Include information regarding the environment in which the system operates. (eg, define temperature, voltage etc). **Ancillary function** - which provide additional useful functions either as enhanced capability, additional capability or opportunistic. **Protective function** - such as alarms and automatic shutdowns.
Failure mode	Failure modes are the effects by which failures are observed. It includes the manner by which the failure is observed and is generally described by the way in which the failure occurs and its impact, if any, on the equipment operation
Cause of Failure	Need to state the engineering mechanism of failure that leads to the particular functional or conditional failure. Failure causes are derived from the design. They are associated with the detailed design approach taken, the materials used, the operating environment including such information as physical loads and corrosive materials. Human factor information is also required, to support the allocation of warning notices in manuals or service schedules.
Local effects	Identify that impact a particular failure mode has on the operation, function or status of an item. The description of the failure effect must be adequately detailed to allow classification into one of the criticality categories • Hidden/safety/environment • Evident/safety/environment • Evident/economic • Hidden/economic

Heading	Required worksheet information
Crit (Criticality)	Identify the criticality a particular failure mode has on the operation, function or status of the equipment item. Multiple criticalities may be entered for a failure mode • **H** - Hidden – Loss of function is not evident to the operator • **S** – Safety – Loss of function is likely to lead to death or injury • **E** – Environmental – Loss of function results in adverse impact on the environment • **O** Operational/economic impact only
Failure Rate, %	Identify the rate at which this type of failure occurs in failure per million hours (FPMH). If data is not available to establish exact rates, enter the indicative percentage in the next column (with % symbol) that this failure mode / cause combination contributes to the total equipment MTBF
Tasks	Identify preventive maintenance task which effectively addresses the failure mode/cause. If there is no scheduled preventive task, enter the corrective task in this field. Preventive maintenance tasks are to be split into and “on” or “off” system. The maintenance task must fall into one of the following categories: • Service / lubrication task • Condition monitoring task include examinations for indications of conditional failure before they lead to functional failure • Scheduled restoration or rework at some hard time conducts a schedule of maintenance tasks • Scheduled discard which at some time removes an item from the system • Failure finding task which is only applicable to hidden functional failures where a confidence check that the system is still operational is required at some interval to reduce the probability of multiple failures
Type	Identify type of Maintenance Task using the code letters on the worksheet.
Period	Frequency for the maintenance Task - time, operational count, operational event(s), etc

Annexure C – Standard Terminology

(extract from MRAM 4.3.6)

Each task statement should have the standard structure shown at Figure 4.23

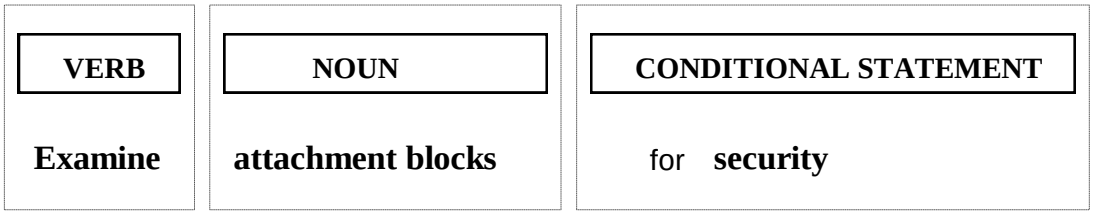


Figure 4.23 Standard task statement structure

The verbs are the key words which define the task action and have a standardised description. The remainder of the statement will depend on the particular item and failure mode and hence use conventional English meanings. These key verbs are listed in Figure 4.24:

Verb	Detailed requirement
Examine	Carry out a visual survey of the condition of an item without dismantling (unless directed to do so by the maintenance instruction).
Lubricate	Apply a specified lubricant (e.g. oil type XYZ, grease type ABC) to a specified area of equipment (often specified in a separate lubrication chart).
Check	Make a comparison of a measurement of some quantity (e.g. time, pressure, temperature, resistance, dimension) to a known value (accept/reject criteria) for that measurement and if required rectify and/or replenish if necessary.
Check Operation or Operate	Ensure that an item of equipment or system functions correctly as far as possible without the use of test equipment or reference to a measurement.
Clean	Remove contaminating materials (e.g. dust, dirt, moisture, excessive lubricant) from an item of equipment.
Adjust	To alter as necessary to make an item compatible with system requirements.
Test	Determine by using appropriate test equipment that a component of equipment functions correctly.
Replenish	Refill a container to a predetermined level, pressure or quantity and undertake associated access and closure tasks.
Fit	Correctly attach an item to another.
Refit	Fit an item that has been previously been removed.
Calibrate	Make a comparison of a measurement of time, pressure, temperature, resistance, dimension or other quantity to a known standard (usually a NATA laboratory function).
Disconnect	Uncouple or detach cables, pipelines or controls.
Reconnect	Reverse of disconnect.
Safetyseal	Securing of equipment which requires the breaking of a seal to manually operate (usually associated with emergency equipment).
Remove	Correctly detach one item from another.
Secure	To make firm or fast.

Figure 4.24 Task verbs - standard terminology

Annexure D – Sample Compliance Checklist

Network Standard Checklist Form

NS212 Integrated Support Requirements for Ausgrid Network Assets

Project Identification:	
Prepared by: <Name & Position Title>	Date:

This checklist is for internal Ausgrid use only and does not apply to ASPs or contractors who have specific compliance requirements in relation to Contestable project works. The checklist is unique for each network standard and is available within BALIN and the BMS as a separate form that can be amended as required, completed and saved in TRIM with the other project documentation.

This section is used to identify compliance checks that when applied to the work associated with this Network Standard will satisfy an audit process to establish that the requirements of the standard have been followed. It is expected that applicable items would normally be checked as Comply (Yes) as non-compliance is generally not tolerated.

Where non-compliance is the result of specific site conditions or design decisions this needs to be identified in the notes section of the form for each non-compliance and approval sought from an appropriately authorised Ausgrid manager responsible for design approval per NS261 Compliance Framework for Network Standards.

Should additional information be available to document non-compliance decisions, these can be attached to the checklist form. The checklist and any attached explanatory notes should be saved in the project document repository.

Item	Description	Refer Clause	Completed/ Actioned
	Scope		
	This Standard specifies the requirements and conditions for approval to install private attachments on Ausgrid poles and street lighting columns.		
	Integrated Support Requirements		
1	Designers, manufacturers and suppliers of plant and substances used by people at work comply with requirements of Work Health and Safety Act 2011	6.0	Yes/No/NA
2	Planned maintenance requirements of plant has been supplied.	7.2.1	Yes/No/NA
3	Maintenance requirements analysis (MRA) undertaken using Ausgrid Maintenance Requirements Analysis Manual.	7.2.2	Yes/No/NA
4	WHS implications analysed and documented prior to completion of maintenance standards/service schedules.	7.2.2	Yes/No/NA
5	Failure Mode, Effects and Criticality Analysis (FMECA) completed and supplied as part of the MRA.	7.2.3	Yes/No/NA
6	Technical Maintenance Plan prepared as a result of the MRA.	7.2.4	Yes/No/NA
7	Recommended spares list prepared.	7.3.3	Yes/No/NA
8	Equipment manuals supplied with the equipment order.	7.4.1	Yes/No/NA

Item	Description	Refer Clause	Completed/ Actioned
9	Operations training program prepared for the equipment.	7.5.1	Yes/No/NA
10	Maintenance training program prepared for the equipment.	7.5.2	Yes/No/NA
11	Special tools and associated equipment supplied with the new equipment.	7.6	Yes/No/NA

Notes:

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