

Substation Maintenance Instruction

Voltage regulating equipment

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Substation Maintenance Instruction

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SMI 110 VOLTAGE REGULATING EQUIPMENT

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1.0 PURPOSE

To set out in detail the requirements for routine maintenance for voltage regulating equipment installed in transmission substations, zone substation, regulating substations and distribution network.

2.0 SCOPE

This instruction is to be read in conjunction with Substation Maintenance Instruction SMI 100 and Substation Maintenance Instruction SMI 101 for distribution and transmission equipment respectively for maintenance interval. The routine maintenance requirement comprises an inspection and minor overhaul.

This document specifies the maintenance instructions for routine maintenance for voltage regulating equipment (V/R). Detailed maintenance procedures are the responsibility of the Regional Transmission Managers when the V/Rs are installed in the zone substation, regulating substation, etc. and the responsibility of the Regional Distribution Managers, where V/Rs are installed in the distribution network.

3.0 REFERENCES

- Company Policy 2.1 – Risk Management
- Company Policy 3.18- Work , Health and Safety
- Company Policy 4.0 – Environment
- Company Policy 9.1.10 – Network Electrical Safety
- Company Policy 9.2.5 – Network Asset Design
- Company Policy 9.9.1 – Network Asset Maintenance
- Company Procedure GSY 1066 - Worksite hazard and risk assessment
- Mains Maintenance Instruction MMI 0001- Pole and line inspection and treatment procedures
- Substation Design Instruction SDI 220 – Cooper Power Systems voltage regulator VR-32
- Substation Maintenance Instruction SMI 100 – Minimum requirements for maintenance of transmission and zone substation equipment
- Substation Maintenance Instruction SMI 101 – Minimum requirements for maintenance of distribution equipment
- Substation Maintenance Instruction SMI 113 – Distribution and field transmission data asset structure and nameplate details
- Substation Maintenance Instruction SMI 124 – Maintenance data entry and defect prioritisation
- Network Management Plan December 2013 Review
- Electrical Safety Rules
- *Electricity Supply Act 1995* (as amended)
- ENA National Electricity Network Safety Code (Doc 01-2008)
- *Work Health and Safety Act 2011(NSW)*
- Cooper Power Systems document no. S225-10-2 Spring-drive and direct-drive tap changer Switches in VR-32 Operating, maintenance, troubleshooting and parts replacement instructions

4.0 DEFINITIONS AND ABBREVIATIONS

Content server

Endeavour Energy's document management system

Ellipse

Endeavour Energy asset database

LDC

line drop compensating unit

SCADA

Supervisory Control and Data Acquisition

SDI

Substation Design Instruction

SMI

Substation Maintenance Instruction

V/R

voltage regulation control equipment

5.0 ACTIONS

5.1 General requirements

Where the equipment is found to be in a non-serviceable condition, notify the Network Maintenance Manager, Primary Systems.

5.2 Defect recording

All defects and abnormalities found during routine maintenance are to be recorded in Ellipse system.

Due to the age of some equipment on the network, it is required that, for the particular item on which the maintenance work is being carried out, the nameplate data that has been recorded in Ellipse be confirmed, and the nameplate data that has yet not been recorded in Ellipse be captured and entered into Ellipse.

After inspection, measurement and operational checks of voltage regulating equipment, including any photo taken, all test values/records shall be entered into Endeavour Energy's G: drive maintenance folders. For this purpose, the following links shall be used for entry of data for each of the Regions:

G:\EE Maintenance\Transmission\ XX Maintenance Data\ YY \ Voltage Regulator
G:\EE Maintenance\Distribution\ XX Maintenance Data\ ZZ \ Voltage Regulator

Where XX is region name and
YY is substation name
ZZ is depot name

See below example:

G:\EE Maintenance\Transmission\Central Maintenance Data\Abbotsbury ZS - 9757\Voltage Regulator

G:\EE Maintenance\Distribution\South Maintenance Data\Ulladulla\Voltage Regulator

5.3 Routine maintenance

5.3.1 General

As a minimum, the routine maintenance task must be carried out in accordance with manufacturer's recommendation; the maintenance requirements of voltage regulating equipment outlined in this document must also be met.

5.3.2 In-service inspection

Description of task	VR-32	Other V/R in network – GEC; REINHAUSEN; EMAIL ELECT
GENERAL		
a) Inspect condition and report any defects.	x	x
b) Ellipse data validation: - Confirm the nameplate data that has been recorded in Ellipse. - Capture the nameplate data that has not been recorded or incorrectly entered in Ellipse and update accordingly.	x x	x x

5.3.3 Minor overhaul

Description of task	VR-32	Other V/R including GEC; REINHAUSEN; EMAIL ELECT
MEASUREMENTS		
a) Measure line drop compensation (LDC) unit or relay. Note: - LDC resistor must not be shorted out during testing) - Set values are supplied by Manager Network and Asset Planning upon request.	x Control system tolerances ¹ : CL5 and CL6 control systems :± 1%	x TOLERANCES GEC: ± 1.5% REINHAUSEN: ± 1.5% EMAIL ELECT: ± 1.5%
b) Measures float level and adjust if necessary. Note: Set values are supplied by Manager Network and Asset Planning upon request.	x Control system tolerances ¹ : CL5 and CL6 control systems :± 1%	x TOLERANCES GEC: ± 1.5% REINHAUSEN: ± 1.5% EMAIL ELECT: ± 1.5%

¹ VR-32 Control system - Cooper Power Systems

Description of task	VR-32	Other V/R including GEC; REINHAUSEN; EMAIL ELECT
c) Measure bandwidth and adjust if necessary. Note: Set values are supplied by Manager Network and Asset Planning upon request.	x Control system tolerances ¹ : CL5 and CL6 ¹ control systems :± 1%	x TOLERANCES GEC: ± 1.5% REINHAUSEN: ± 1.5% EMAIL ELECT: ± 1.5%
Connections		
d) Inspect all screws, nuts and flexible connections for tightness.	x	x
Contacts:		
e) Inspect all contacts for wear and defects.	x Refer SDI 220 and S225-10-2 for information on contact wear inspection and replacement.	x Refer manufacturer Manuals for others. GEC: AVE 3,4,5 REINHAUSEN: Solid state MK20 EMAIL ELECT: 2V161V
Description of task	VR-32	Other V/R including GEC; REINHAUSEN; EMAIL ELECT
OPERATIONAL CHECKS		
f) Check automatic operation of the tap changer is OK.	x	x
g) Check line drop compensation operates correctly.	x	x
h) Check tap changer raise/lower operates correctly	x (Performed in manual mode of operation). Refer to Maintenance Program S225-10-10.	x Refer manufacturer Manuals/catalogue GEC: AVE3,4,5 REINHAUSEN: Solid state MK20 EMAIL ELECT: 2V161V
i) Check tap changer automatic raise/lower timer operates correctly and adjust if necessary.	x	x
j) Check fault lockout operation, delay time and alarms	x (Where provided and/or connected to SCADA).	x (Where provided and/or connected to SCADA).

Description of task	VR-32	Other V/R including GEC; REINHAUSEN; EMAIL ELECT
k) Check signal timer alarm and delay time	x (Where provided and/or connected to SCADA)	x (Where provided and/or connected to SCADA)
Ellipse data validation		
l) Confirm the nameplate data that has been recorded in Ellipse.	x	x
m) Capture the nameplate data that has not been recorded or incorrectly entered in Ellipse and update accordingly.	x	x

6.0 AUTHORITIES AND RESPONSIBILITIES

Chief Engineer has the authority and responsibility for approving this instruction.

Manager Primary Systems has the authority and responsibility for making recommendations to the Chief Engineer in respect to this instruction.

Network Maintenance Manager, Primary Systems has the authority and responsibility for maintaining the content of this instruction up to date.

Manager Network and Asset Planning has the authority and responsibility for providing up to date settings for V/R as requested.

Endeavour Energy employees and/or contractors have the authority and responsibility for:

- confirming that the requirements of this instruction are met;
- working in accordance with local and statutory requirements;
- maintaining a high level of public safety;
- working in accordance with Endeavour Energy's Electrical Safety Rules; and
- updating the Ellipse database.

All **Regional Transmission Managers** have the authority and responsibility for:

- confirming that Endeavour Energy employees and/or contractors engaged to perform the work have appropriate qualifications and are competent to carry out the work;
- identifying potential problems with equipment when test reports are received;
- confirming that work performed is carried out in accordance with local and statutory requirements;
- maintaining a high level of public safety;
- confirming that employees are conversant with and work in accordance with the principles of the Electrical Safety rules; and
- analysing the test results to identify potential problems and taking appropriate action.

All **Regional Distribution Managers** have the authority and responsibility for:

- confirming that Endeavour Energy employees and/or contractors engaged to perform the work have appropriate qualifications and are competent to carry out the work;
- identifying potential problems with equipment when test reports are received;
- confirming that work performed is carried out in accordance with local and statutory requirements;
- maintaining a high level of public safety;
- confirming that employees are conversant with and work in accordance with the principles of the Electrical Safety rules; and
- analysing the test results to identify potential problems and taking appropriate action.

7.0 DOCUMENT CONTROL

Documentation content coordinator: Network Maintenance Manager, Primary Systems

Documentation process coordinator: Standards Process Coordinator