

1. SCOPE

This document details the application of SOP 416 (Applicable to AEI Type JW420 275 kV circuit-breakers) issued by the Energy Networks Association.

2. ISSUE RECORD

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Issue Date	Issue No.	Author	Amendment Details
28 September 2020	1	Kevin Butter	Initial issue
14 June 2021	2	Kevin Butter	SOP 416 now lifted after inspection of all JW420 circuit-breakers in SPEN.

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
Name: Kevin Butter Title: Lead Engineer	Name: Fraser Shaw Title: Substations Manager	Name: Fraser Ainslie Title: Head of Engineering Design and Standards

4. REVIEW

This is a Reference document which has a 1 year retention period after which it will automatically be archived.

5. DISTRIBUTION

This document is not part of a Manual maintained by Document Control and does not have a maintained distribution list.

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7. SOP DETAILS

EQUIPMENT TYPE	AEI JW420 275 kV circuit-breakers
ORIGINATING COMPANY	SP Energy Networks
DATE	28 th September 2020
NUMBER INSTALLED IN ENERGY NETWORKS NORTH	12
NUMBER INSTALLED IN ENERGY NETWORKS SOUTH	0
REASON	<p>On 20th September 2020, an AEI JW420 275 kV bulk oil-circuit-breaker suffered a catastrophic failure of the red-phase (busbar side) bushing. The debris from the bushing (including large portions of porcelain) were expelled and were found up to 35 m away from the source.</p> <p>Investigation into the cause of the failure is ongoing.</p>
STATUS IN INITIATING COMPANY	<p>Risk Management Zones (RMZ) of 40 m have been established around all AEI JW420 275 kV circuit-breakers in SP Energy Networks.</p> <p>The use of partial discharge monitoring is being considered as mitigation for accessing any RMZ.</p>
SPEN APPLICATION	As detailed above.
ADDITIONAL INFORMATION	None
UPDATE	<p><u>14th June 2021</u></p> <p>An Investigation into the failure of the BL barrier bushing was established and forensic experts were employed to examine the faulty bushing and healthy bushings to establish the failure mechanism.</p> <p>The forensic examination of the failed bushings found considerable corrosion and particulate matter in the top cap of the BL barrier bushing. It concludes that when the bushing was flushed with clean oil through the breather cap as part of the maintenance activity, some of this particulate was washed down into the main body of the bushing. This caused contamination of the bushing in areas of high electrical stress and lead to the failure of the bushing soon after energisation.</p> <p>The inside of the top cap on all BL barrier bushings on JW420 275 kV circuit-breakers have now been examined using an endoscope and no further incidences of severe corrosion has been found. The gaskets on all breather caps have been replaced to prevent ingress of moisture and the practice of flushing bushings with oil has been ceased.</p>

	<p>Consequently, SOP 416 affecting all JW420 circuit-breakers can be lifted.</p> <p>Also refer to SOP 411 concerning deterioration of BL barrier bushings on JW420, OW410 and XOPR60 circuit-breakers and wound VT Type VLS.</p>
REMEDIAL ACTION	<p>All AEI JW420 275 kV circuit-breakers will be replaced and managed until replacement programme has been completed.</p>

8. SOP HEADER

Field Name	Field Value	Field Size
Name (SOPXXX) *	SOP416 - AEI JW420 bushing failure	61
The reason for the Operational Restriction *	275 kV OCB bushing failure	30
Nature of the Operational Restriction *	No access within 40m Risk Management Zone.	50
Comments *	Risk Management Zones of 40 m to be applied around all AEI JW420 circuit-breakers. Access to be controlled by Transmission Field Operations Manager to allow testing of bushings to clear the SOP.	200
Restricted Access to Substation Flag *	Y	1
SOP Impact Code * <i>(highlight or underline the appropriate code)</i>	0 Temporary/Impact under assessment 1 Very minor operational/network impact 2 Moderate operational/network impact <u>3 Significant impact on system perf./measurable business costs</u> 4 Inoperable without intervention 5 Inoperable – no cost effective solution/must be replaced	N/A
SOP component type * <i>(highlight or underline the appropriate code)</i>	<u>01 Bushing only</u> 02 Circuit Breaker 03 Fixed Portion only 04 Moving Portion only 05 Switch 06 RMU 07 Transformer only 08 Tap Changer only 09 Transformer & Bushing 10 Transformer & Tap Changer	N/A
Search Criteria *	AEI/METRO VICKS JW420, GEC JW420	N/A

* This denotes a Mandatory Field