1. SCOPE

This document details the application of SOP 442, applicable to Lucy AcuLok LV cabinets, issued by the Energy Networks Association.

2. ISSUE RECORD

This is a Reference document. The current version is held on the EN Document Library.

It is your responsibility to ensure you work to the current version.

Issue Date	Issue No.	Author	Amendment Details
April 2025	1	Benjamin Hughes	Initial issue

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
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4. REVIEW

This is a Reference document which has a 5-year retention period after which a reminder will be issued to review and extend retention or archive.

5. DISTRIBUTION

This document is not part of a Manual maintained by Document Control and does not have a maintained distribution list. It is published on the SP Energy Networks website.

6. CONTENTS

7. SOP DETAILS

EQUIPMENT TYPE	Lucy AcuLok LV Cabinets
ORIGINATING COMPANY	SP Energy Networks
DATE	29/01/25
NUMBER INSTALLED IN ENERGY NETWORKS NORTH	885
NUMBER INSTALLED IN ENERGY NETWORKS SOUTH	279
REASON	This SOP has been raised following the disruptive failure of a Lucy AcuLok LV cabinet at Rail Freight Depot substation. The LV cabinet was found to be smoking, with significant heat identified as originating from the L3 transformer disconnector. Following investigation at Lucy's Thame factory it was noted that both the L2 and L3 disconnectors showed signs of poor electrical contact leading to arc damage of the main contacts and melting of the plastic components associated with the disconnector. This SOP also covers the known type-defect of pre-serial no. LVT0002225 AcuLok transformer disconnectors. The early design leaf spring mechanisms have the potential to deform causing operation to become stiff or to seize.
STATUS IN INITIATING COMPANY	This SOP has two parts. An operational switching ban on early design disconnectors (pre-LVT0002225) and a mandated temperature survey/operation check on the entire range. <u>Part 1. Lucy AcuLok LV Cabinets prior to serial LVT0002225</u> Lucy AcuLok transformer disconnectors in cabinets manufactured prior to LVT0002225 shall not be operated or used as a point of isolation unless replaced with the later design disconnector as per SWG-17-114. Note – Once disconnectors subject to Part 1 of this SOP are replaced, the cabinet serial number shall be suffixed 'M' to indicate the later design has now been installed & Part 1 of this SOP no longer applies. <u>Part 2. Lucy AcuLok LV Cabinets – Entire Range</u> Prior to operation of a Lucy AcuLok transformer disconnector a thermal survey shall be completed. If a variance of 10◦C between phases, or any phase is 20◦C above ambient temperature there shall be no operation of the disconnector. Inform Control to restrict operation accordingly & arrange prompt de-energisation of the LV cabinet. The only acceptable deviation from the above thermal survey is where the disconnector has been OPEN

	or de-energised for a period resulting in negligible heat present. Providing no significant temperature has been identified, operation may continue with a further check to complete. Each disconnector has an associated green tab, which is either protruding 30mm (+/- 1mm tolerance) when the disconnector is fully OPEN or flush (2mm tolerance) with the blue cassette body when the disconnector is fully CLOSED. Following either an OPEN or CLOSE operation the green tab shall be checked to ensure the disconnector has fully completed its travel. If, following operation, the green tab is not in its correct position as described there shall be no further operation of the disconnector. Inform Control to restrict operation accordingly & arrange prompt de-energisation of the LV cabinet. Note – it is permissible for the circuit-side fuse stalks to remain live when de-energising the LV cabinet. If any issues are found the disconnector shall not be operated or used as a point of isolation & the LV cabinet shall be replaced.
SPEN APPLICATION	As Above
ADDITIONAL INFORMATION	There is a type defect in earlier AcuLok disconnector design (pre serial no. LVT0002225) in which the disconnector leaf springs can distort causing misalignment of the sliding portion. This can cause the disconnector to jam in the CLOSED position. The leaf springs, once distorted, can cause misalignment & stiffness during an OPEN or CLOSE thus creating the potential for incomplete operation. The recent failure of the AcuLok at Rail Freight Depot substation is outside of the affected range relating to the early leaf spring design & there is a further issue relating to poor electrical contact of the disconnector. Lucy have provided an updated operating guide LIP 10-047 Issue 2 and an inspection procedure LIP 10-055 Issue 2. Both are appended to this SOP for reference.
UPDATE	None
REMEDIAL ACTION	Lucy Electric are providing disconnector cassettes as necessary to replace early designs. This SOP is permanent regardless of disconnector replacements. Lucy Electric are continuing to investigate & trend reported disconnector failures to determine a root cause.

8. SOP HEADER

Field Name	Field Value	Field Size
Name (SOPXXX**)** *	SOP442	6
The reason for the Operational Restriction *	Poor contact/overheat TX disc	30
Nature of the Operational Restriction *	No op <LVT0002225 & thermal survey/tab check	50
Comments *	No op or POI of units pre LVT0002225 Thermal survey prior to op. Examine green tab to ensure op is complete. Any issues found, inform Control & de-energise LV cabinet. No further op & POI prohibited.	200
Restricted Access to Substation Flag *	N	1
SOP Impact Code * *(highlight or underline the appropriate code)*	0 Temporary/Impact under assessment 1 Very minor operational/network impact 2 Moderate operational/network impact 3 Significant impact on system perf./measurable business costs 4 Inoperable without intervention 5 Inoperable – no cost effective solution/must be replaced	N/A
SOP component type * *(highlight or underline the appropriate code)*	01 Bushing only 02 Circuit Breaker 03 Fixed Portion only 04 Moving Portion only 05 Switch 06 RMU 07 Transformer only (Applicable to the LV Cabinet) 08 Tap Changer only 09 Transformer & Bushing 10 Transformer & Tap Changer	N/A
Search Criteria *	Description of Equipment Manufacturer = Lucy Serial Number = Starting with LVT	N/A

* This denotes a Mandatory Field

9. OEM REFERENCES

Note the following supplier references provide additional detail and context and are not intended to deviate in any way from this SOP.

9.1 AcuLok TMFC Inspection LIP 10-055 Issue 2

Inspection procedure for AcuLok TMFC

Observe Company Site Safety rules at all times and ensure that the personnel carrying out the inspection are fully familiar with the operation of AcuLok TFMC cabinets and have the correct Permits to Work.

Situation: Sub Station is live and actively supplying the installation

Steps for investigation

See notes below for more detailed explanations of each step.

Checking for overheating:-

1. Check for any external signs of overheating
2. Check internally for signs of overheating
3. Conduct a thermal investigation of the three blue disconnectors
4. If any abnormal observations (as detailed in the inspection notes) are made from steps 1,2 & 3, Contact Lucy Electric directly and do not attempt to operate any of the disconnectors.

Checking for correct operations of the disconnectors:-

5. Check that the green tabs on each disconnector are completely flush with the blue cover when the disconnector is in "ON".
6. If the Green tabs are all flush in then no further action is required.
7. If any of the tabs are protruding from the blue disconnector cover and overheating was observed above, do not attempt to switch any of the disconnectors.
8. Only if no abnormal observations are made from 1, 2 & 3 above and the green tabs are protruding, insert the operating handle fully, as detailed in operating procedure LIP10-047, and lift it up to fully engage the Disconnect into "ON". At the same time the green tab should fully retract to the flush position, indicating that the disconnector is correctly switched into "ON".

Notes to explain Investigation Steps

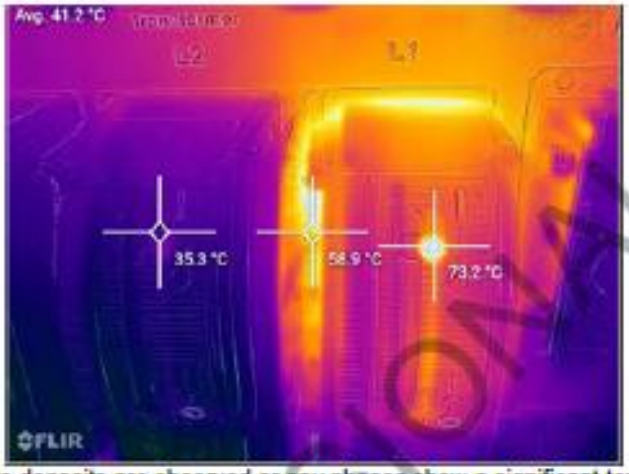
Checking for overheating:-

Upon entering the Sub Station, check immediately for the acrid smell of hot plastic or insulating material and listen for buzzing or fizzing sounds all of which are symptomatic of over heating and / or discharge.

With the cabinet door closed, check for deposits of white/beige powder around the vents at the top of the cabinet both at the front and rear of the roof panel. If the commonly present cobwebs are laden with a white deposits this is a sign that overheating has/is taking place. These white deposits are the flame retardant added to the plastics during the moulding process and there are no concerns under COSHH regarding handling.

Opening the cabinet door and check the area for further white deposits around the disconnector & instrument panel.

Next conduct a thermal investigation of the three disconnector bodies paying particular attention to any unexplained discrepancies between phases. **Any disconnector that is running significantly hotter than any other phases also suggest potential overheating within that Disconnector phase (see picture below).**



If either signs of white deposits are observed or any phases show a significant temperature difference, do not attempt to operate any of the disconnectors.

If the readings show a variance of 10°C between phases or any phase is 20°C above ambient temperature, do not attempt to switch the disconnector. All further activity should be suspended and Lucy Electric Energy Services contacted for immediate intervention. This may require a disconnector replacement which will necessitate a HV shutdown.

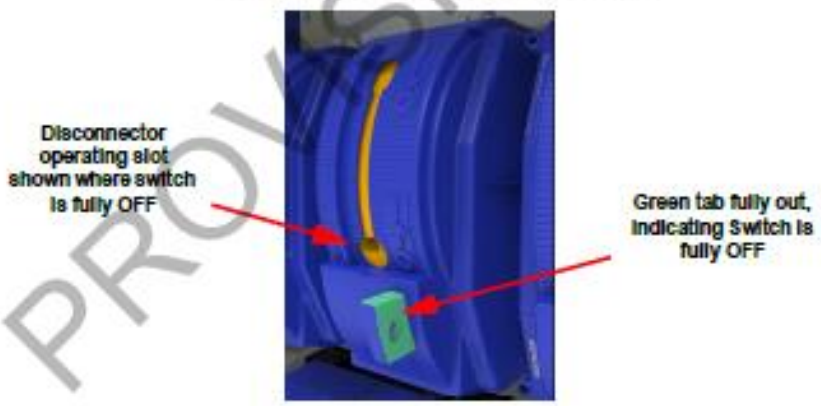
Checking for correct operations of the disconnectors:-

Next, visually check the position of the cassette tabs which should be flush with the front face of the blue disconnector housing indicating that the disconnector contacts correctly engaged and the switch is fully in "ON".

It should not be possible to remove the operating handle until the Disconnector is fully in On, if force has been applied to remove the handle prematurely it becomes possible to repeatedly do this, in these cases it is essential to check that the green tabs are fully flush with the blue cover when the disconnector is in ON.

If the green tabs are protruding, and there are no signs of overheating, insert the operating handle and attempt to operate the handle upwards until the contacts are fully engaged and the tabs fully flush with the blue cover. If this is not possible contact Lucy Electric Energy Service to arrange a site visit.

Disconnector Shown In OFF Position



Note: The green tab should either be protruding 29 – 31 mm when the disconnector is fully OPEN or flush with the blue cassette body when the disconnector is fully CLOSED.

9.2 AcuLok Disconnector Operation LIP 10-047 Issue 2

AcuLok Disconnector Operation

⚠ CAUTION **When operating the AcuLok disconnector the following procedure MUST BE adhered to.**

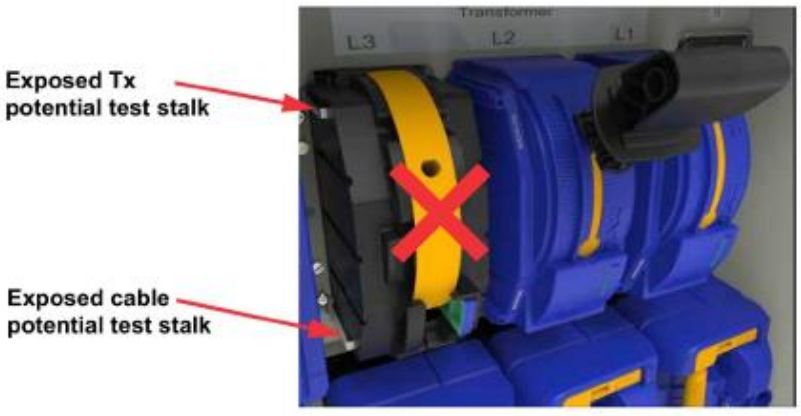
- **Always operate disconnector with the designated Lucy handle, not a screwdriver or other improvised tool (see observation 1).**
- **Always operate disconnector with cover in place (see observation 2).**
- **Always ensure handle is fully home & correctly inserted (see observation 3).**
- **Disconnector should operate freely. Force to operate handle is less than 20Kg.**
- **Never remove the blue disconnector cover with the cabinet live as test contacts will be exposed.**

Observation 1

Never use a screwdriver or other improvised tool.

Observation 2

Always operate the disconnector with the blue cover in place as failure to do so will expose the live test contacts.



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Observation 3

Always ensure handle is fully home and in the correct orientation.
The step in the black handle must face downwards (see observation 4).

Link Closed **Link Open**

Step in handle facing down

Observation 4

This view shows handle being correctly inserted
(flat side of shaft to flat in orange mounting).

Do not attempt to forcefully insert the handle in this orientation.

Operation Sequence

1. START position with contacts closed. Insert operating handle in correct orientation.

Contact Closed:
Green Tab Flush

2. Move handle downwards with a firm gesture. Handle travels smoothly all the way to the bottom of the stroke.

Contact Open:
Green Tab Out