Top Energy Limited
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25 August 2026

Commerce Commission
PO Box 2351
Wellington 6140
New Zealand

Dear Regulation Branch

EXTREME EVENT STANDARD REPORTING – KAIKOHE ZONE SUBSTATION CIRCUIT BREAKER FAILURE, 6 NOVEMBER 2025

Top Energy Limited (Top Energy) writes to formally present its disclosure report in respect of the event that occurred on 6 November 2025 at Kaikohe Zone Substation, in accordance with its obligations under the Electricity Distribution Services Default Price Quality Path Determination 2025 clause 12.5 and 12.6

Details of the event are as follows:

- Start Date: 06 November 2025
- Start Time: 17:20
- End Date: 06 November 2025
- End Time: 23:44
- SAIDI (raw)/(normalised) Value: 202.153 / 0.558
- SAIFI (raw)/ (normalised) Value:
- ICP Customer Minutes: 7,298,530

The event affected 23,124 customers and was the result of a catastrophic failure of Schneider Electric GHA-36-25-25 circuit breaker (CB163612) at Kaikohe 33 kV Zone Substation . The failure caused an internal arc flash and a sudden pressure release of sufficient force to blast open the substation equipment doors.

Investigation process

Top Energy initiated a comprehensive investigation programme immediately following the event. Four separate investigations and reviews have been completed:

- **ICAM Stage 1** – Equipment Failure (completed January 2026): An internal investigation examining the full asset lifecycle of the failed circuit breaker, from manufacture through to the moment of failure, covering installation, commissioning, maintenance, and operation.
- **ICAM Stage 2** – Customer Impact (completed March 2026): A separate internal investigation examining why the failure resulted in a full busbar outage affecting all 23,000 customers, rather than a partial outage as the protection design intended.
- **Schneider Electric Forensic Investigation** (report received March 2026; full report May 2026): A comprehensive forensic investigation by the original equipment manufacturer, conducted with Top Energy and its insurers present. Independent third-party analysis of relay data was also commissioned.

- **Independent Review by Ergo Consulting** (completed June 2026): An independent external review of Top Energy's asset management practices and lifecycle management for the affected switchgear, and a review of the two internal ICAM investigations. External consultant resources are used to support project management and commissioning for complex projects where the specialist skills or capacity required are not held in-house, which is common practice across the electricity distribution industry for infrequent, technically demanding substation works.

The investigation findings were presented to the Top Energy Board across three separate board papers (February, May, and June 2026). The attached close-out report was presented to and noted by the Top Energy Board in June 2026.

Key findings

On the cause of the equipment failure:

- The circuit breaker failed due to an internal fault within its sealed SF_6 gas chamber. The asset is classified as 'maintenance-free' by the manufacturer. The fault originated within a factory-sealed chamber that is inaccessible to both Top Energy and Schneider Electric's local service teams.
- Despite extensive forensic testing and review, Schneider Electric was unable to determine a definitive root cause for the failure.
- Top Energy's maintenance programme exceeded the manufacturer's recommended regime. Ergo Consulting independently confirmed there is no evidence that asset lifecycle management practices contributed to the failure.
- The investigations concluded that there were no meaningful actions Top Energy could have taken – through commissioning, maintenance, or operations – to prevent this failure.

On the scale of the customer outage:

- The full busbar outage was caused by arc flash protection wiring (ILIS system) at Kaikohe that did not conform to Top Energy's Network Protection Design Standard. The wiring connected Bus A and Bus B trips together in the bus coupler panel, meaning a fault on either bus tripped both busbars simultaneously.
- The switchboard was built and wired in line with Schneider Electric's default manufacturer configuration, which differs from Top Energy's protection standard. Inconsistent drawings from both Schneider Electric and Top Energy contributed to the error not being detected at the time of commissioning in 2013–2014.
- Under the correct protection configuration, the event would not have exceeded the extreme event threshold. An estimated 2,000 customers would have been initially affected. The full busbar isolation required for safety checks would have extended this to approximately 21,000 customers for around one hour — within the extreme event limit of 6 million customer minutes (estimated 2,328,216 customer minutes, against a threshold of 6,000,000).
- The wiring discrepancy was not identifiable through normal in-service maintenance activities. It is not recognised industry practice to perform preventative checks for commissioning wiring errors on live switchgear.

Process gaps identified:

- The commissioning process at the time of the 2013 switchboard project was not sufficiently robust to detect the deviation from Top Energy's protection design standard.
- Project construction and commissioning documentation was not captured and stored appropriately following project completion.
- External consultant staff engaged at the time were not adequately inducted into Top Energy's technical standards. External consultant resources are used to support project management and commissioning for complex substation projects, and the induction and familiarisation process for such resources has since been reviewed.

Remedial actions and next steps

Top Energy has taken the following remedial actions and has the following actions in progress:

- Bus A arc flash protection wiring at Kaikohe has been corrected and tested.
- A network-wide check of arc flash protection wiring on all Schneider Electric GHA and GMA switchgear is underway. Ngāwha Transmission has been confirmed. Remaining sites are planned for FY2027, with an external contractor (Omexom) engaged to complete the wiring review commencing August 2026.
- A robust project commissioning process is being developed, covering roles and responsibilities, technical verification requirements, and document retention standards.
- Technical induction and familiarisation requirements for external consultants and contractors engaged on substation projects are being reviewed, with records to be retained going forward.
- These actions form part of Top Energy's broader Network Improvement Programme, which is reported to the Board monthly.

Enclosed documents

The following documents are enclosed with this letter:

Document ID	Document Title
	Extreme Event Reporting Statement
Appendix A	Board Report _ Kaikohe close-out
Appendix A1	Kaikohe GHA closeout
Board Report – Kaikohe Close out Appendices 1 – 10 :	
Appendix 1	ICAM Investigation Report: Equipment Failure (Stage 1)
Appendix 2	ICAM Investigation Report: Customer Impact (Stage 2)
Appendix 3	Final Kaikohe GHA internal arc event - Schneider
Appendix 4	Schneider Investigation – Supporting data

Appendix 5	Ergo Investigation - Independent investigation ToP Energy asset management practices
Appendix 6	Board Update: initial findings
Appendix 6.1	Board Paper February 2026 _ Appendix One - Failed circuit breaker CB163612 from Kaikohe 33kV substation – Initial Findings
Appendix 7	Board Paper May 2026 – ICAM summary
Appendix 8	Network Improvement Board Papers
Appendix 9	Event Log and Outage Alternative Scenario modelling
Appendix 10	Maintenance Records

Top Energy is committed to transparency in this matter. If the Commission requires any further information or clarification, please contact Claire Picking, General Manager Network.

Russell Shaw

Chief Executive
Top Energy Group

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Extreme Event Standard Reporting Statement

Determination Clause	Determination requirement	What Needs to be Prepared	Report Statement section
An Extreme Event Standard Reporting Statement must be provided to the Commission consisting of:			
12.6(a)	Reasons for non-compliance with the extreme event standard specified in clause 9.10	Explanation of why the extreme event standard in clause 9.10 was not met, including supporting evidence.	Section 1
12.6(b)	Details of each Class C interruption starting within the extreme event	A table listing every Class C interruption that started within the extreme event, including start and end date (dd/mm/yyyy) and start and end time (hh:mm) and SAIDI and SAIFI value.	Section 2
12.6(c)	Existing independent reviews of the state of network or operational practices completed.	Copies or references to any independent reviews completed during the assessment period or the previous three assessment periods relating to network condition or operational practices.	Nil
12.6(d)(i)	Asset Condition Analysis; or	Trends in asset condition for any assets relating to the extreme event.	Section 3 **Appendix 1** – ICAM Investigation Report: Equipment Failure (Stage 1) **Appendix 3** – Schneider Electric: Final Investigation Letter (March 2026) **Appendix 4** – Schneider Electric: Full Investigation Report **Appendix 5** – Ergo Consulting: Independent Review Report (June 2026)
12.6(d)(ii)	Asset Replacement and Renewal Sufficiency Analysis	Assessment of whether asset replacement and renewal programmes were sufficient for the affected assets relating to the extreme event.	Section 4 **Appendix 1** – ICAM Investigation Report: Equipment Failure (Stage 1)

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			Appendix 3 – Schneider Electric: Final Investigation Letter (March 2026) **Appendix 4** – Schneider Electric: Full Investigation Report **Appendix 5** – Ergo Consulting: Independent Review Report (June 2026)
12.6(e)	Investigation, Analysis, or Post-event Review	Any investigation, analysis, or Post-event review conducted of the extreme event.	Section 5 **Appendix A and A1** – Board Report – Kaikohe Close out **Appendix 1** – ICAM Investigation Report: Equipment Failure (Stage 1) **Appendix 2** – ICAM Investigation Report: Customer Impact (Stage 2) **Appendix 3** – Schneider Electric: Final Investigation Letter (March 2026) **Appendix 4** – Schneider Electric: Full Investigation Report **Appendix 5** – Ergo Consulting: Independent Review Report (June 2026) **Appendix 6** – Board Update: ICAM Stage 1 (February 2026) **Appendix 7** – Board Update: ICAM Stage 2 (May 2026) **Appendix 8** – Network Improvement Papers **Appendix 9** – Event Log and Alternate SAIDI Study **Appendix 10** – Maintenance Records
12.6(f)	Planned future reviews	An outline of any intended review, intended analysis, or intended investigation that would meet the categories specified in clause 12.6(c)-(e), which is planned, but not yet completed.	Section 6
12.6(g)	Directors Certificate	a certificate in the form set out in Schedule 11, signed by at least one director of the non-exempt EDB.	Section 7

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Purpose and scope

This Extreme Event Standard Reporting Statement is provided by Top Energy Limited (**Top Energy**) to the Commerce Commission (the **Commission**) in accordance with clause 12.6 of the Electricity Distribution Services Default Price-Quality Path Determination 2025 (the **Determination**). It follows the notification made under clause 12.5.

The statement relates to the extreme event that occurred on 6 November 2025 at the Kaikohe 33 kV Zone Substation, being the catastrophic failure of Schneider Electric GHA-36-25-25 circuit breaker CB163612 (the T3 33 kV incomer, panel H05). The statement addresses each matter required by clauses 12.6(a) to 12.6(g), with the relevant clause reference identified against each section.

Event summary

Non-exempt EDB	Top Energy Limited
Location	Kaikohe 33 kV Zone Substation, Southern network
Failed asset	Schneider Electric GHA-36-25-25 circuit breaker CB163612 (T3 33 kV incomer, panel H05)
Start date / time	06/11/2025 17:20
End date / time	06/11/2025 23:44
Customers affected	23,124 ICPs
SAIDI (raw / normalised)	202.153 / 0.558
ICP customer minutes	7,298,530

Document Hierarchy

This statement is supported by a number of investigations, reports and studies, found in the Appendices. They are structured in the following way:

Document ID	Document Title	Description
	Cover Letter to Commerce Commission	Cover Letter to Commerce Commission to present this Statement and subsequent findings.
Board Report for Investigation Summary of Findings		
Appendix A	Board Report _ Kaikohe closeout	Report presented to the board executive summary of findings from various internal and external investigations and studies.

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Appendix A1	Kaikohe GHA closeout	Appendix to board report providing detailing summary of findings from various internal and external investigations and studies. This paper refers to subsequent Appendices 1-10
Appendices to Board Report		
Appendix 1	ICAM Investigation Report: Equipment Failure (Stage 1)	Internal ICAM investigation into the asset failure
Appendix 2	ICAM Investigation Report: Customer Impact (Stage 2)	Internal ICAM investigation into the customer impact
Appendix 3	Final Kaikohe GHA internal arc event - Schneider	Schneider letter to confirm summary of findings
Appendix 4	Schneider Investigation – Supporting data	Supporting information supporting Appendix 3 provided by Schneider
Appendix 5	Ergo Investigation - Independent investigation TOP Energy asset management practices	25317 | 25317-RPT-001 TE requested Ergo Consulting Limited (Ergo) to conduct an independent investigation into the asset management practices and lifecycle management of the Schneider GHA switchboard at TE's Kaikohe substation specifically. In addition, Ergo was also requested to comment on TE's internal ICAM investigations of this asset failure even
Appendix 6	Board Update: initial findings	Board update on initial findings
Appendix 6.1	Board Paper February 2026 _ Appendix One - Failed circuit breaker CB163612 from Kaikohe 33kV substation – Initial Findings	Appendix to Board update, further details on asset failure
Appendix 7	Board Paper May 2026 – ICAM summary	Board update on ICAM 1 & 2 findings
Appendix 8	Network Improvement Board Papers	Papers showing progress against identified areas of improvement following investigation work.
Appendix 9	Event Log and Outage Alternative Scenario modelling	Supporting modelling to identify impact of protection operation
Appendix 10	Maintenance Records	Maintenance records for failed asset

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1. Reasons for non-compliance with the extreme event standard

Clause 12.6(a) – Reasons for non-compliance with the extreme event standard specified in clause 9.10

Top Energy did not meet the extreme event standard specified in clause 9.10 of the Determination for the assessment period. The non-compliance arises from a single extreme event: the circuit breaker failure at Kaikohe on 6 November 2025. The interruption resulting from that event exceeded the extreme event boundary, recording a raw SAIDI contribution of 202.153 minutes and 7,298,530 ICP customer minutes, against an extreme event limit of the order of 120 SAIDI minutes / 6,000,000 customer minutes.

Underlying cause – two distinct factors. The extent of the non-compliance is explained by two separate matters, which the investigations (section 6) treat independently:

- **The equipment failure itself.** CB163612 failed due to an internal fault within its factory-sealed SF_6 gas chamber. The circuit breaker is classified by the manufacturer as 'maintenance-free', and the fault originated in a sealed chamber inaccessible to both Top Energy and Schneider Electric service teams. Despite extensive forensic testing, Schneider Electric could not determine a definitive root cause. The investigations concluded there were no meaningful actions Top Energy could have taken – through commissioning, maintenance or operations – to prevent the failure.
- **The scale of the customer impact.** The single equipment failure resulted in a full busbar outage affecting all customers on the Southern network, rather than the partial outage the protection design intended. This was caused by arc-flash protection wiring (the ILIS system) that connected the Bus A and Bus B trips together in the bus coupler panel – contrary to Top Energy's Network Protection Design Standard ST-A6.3.1-001. A fault on either bus therefore tripped both busbars simultaneously. The wiring was consistent with Schneider Electric's default manufacturer configuration and dates back to the original switchboard project in 2013–2014. Inconsistent as-built drawings from both parties meant the deviation was not detected at commissioning, and it remained undetected until the event because it is not recognised industry practice to test for commissioning wiring errors on live switchgear.

Effect of the wiring non-conformance. Modelling of the correct protection configuration (Appendix 9) shows the event would not have exceeded the extreme event threshold. Approximately 2,000 customers would have been affected initially; the full busbar isolation required for safety checks would have extended this to approximately 21,000 customers for around one hour rather than 6.5 hours. On that basis the estimated impact would have been 2,328,216 customer minutes and 66.20 SAIDI minutes – within the extreme event limits.

2. Details of each Class C interruption within the extreme event

Clause 12.6(b) – Details of each Class C interruption starting within the extreme event

Interruption	Start Date	Start Time	End Date	End Time	SAIDI	SAIFI
INCD-35417-F	6/11/2025 17:21	6/11/2025 17:21	6/11/2025 23:44	6/11/2025 23:44	202.15	0.64

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3. Asset condition analysis

Clause 12.6(d)(i) – Asset Condition Analysis: trends in asset condition for assets relating to the extreme event

The asset relating to the extreme event is the Schneider Electric GHA-series 33 kV SF_6 circuit breaker fleet. This is a well-established switchgear type widely used across New Zealand electricity distribution businesses and Transpower.

Condition trend. No adverse condition trend was identified for the affected asset prior to the failure:

- CB163612 was installed and commissioned in 2014 and was mid-life at the time of failure, well within the expected service life for this switchgear type.
- Maintenance and Inspections for the equipment were scheduled on a three yearly basis, with Manufacturers recommendations being four yearly. Maintenance records can be found in Appendix 10.
- Maintenance records for FY21 and FY24 returned no actionable corrective items for the circuit breaker.
- Circuit breaker timing tests conducted during the FY24 maintenance programme (which exceed the manufacturer's specification) returned results within specification.
- SF_6 gas measurements taken from the remaining panels after the event recorded gas pressure of 100% and average gas purity of 97%, eliminating gas degradation or loss as a contributing condition factor.
- Environmental conditions (temperature, humidity, contamination risk) were verified to be within acceptable limits, the switchboard being installed in a conditioned indoor building.

Conclusion. The failure was a sudden internal fault within a factory-sealed, maintenance-free chamber that is not accessible for condition assessment and could not be detected through in-service condition monitoring, inspection or maintenance. The available condition data showed no deteriorating trend that would have predicted the failure. The most likely origin, in the opinion of Top Energy's engineering team, is arcing damage on the L1-phase current path at a non-user-serviceable joint enclosed within the sealed SF_6 chamber since manufacture.

These findings are discussed in detail, and verified within internal and external investigation papers:

- Appendix 1 – ICAM Investigation Report: Equipment Failure (Stage 1)
- Appendix 3 – Schneider Electric: Final Investigation Letter (March 2026)
- Appendix 4 – Schneider Electric: Full Investigation Report
- Appendix 5 – Ergo Consulting: Independent Review Report (June 2026)

Previous independent reviews have been completed by Ergo Consulting regarding the reliability performance of Top Energy Network. Subsequent Asset Management Plans have included reliability initiative projects as a result of these independent reviews. These were related predominantly to the 11kV network performance and reliability. The reviews completed by Ergo are available upon request:

- Ergo Reliability Review 2023
- Ergo Reliability Review Update 2026

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4. Asset replacement and renewal sufficiency analysis

Clause 12.6(d)(ii) – Asset Replacement and Renewal Sufficiency Analysis for the affected assets

Top Energy has assessed whether its asset replacement and renewal programmes were sufficient for the assets relating to the extreme event. On the evidence of the internal investigations and the independent Ergo Consulting review, they were sufficient:

- The affected asset was not at or near end of life. CB163612 was installed in 2014 and remained mid-life; the failure was not the result of an asset being retained beyond a prudent replacement or renewal point.
- Asset lifecycle management is documented in Top Energy's Asset Management Plan (section 6), where failure modes drive preventative and reactive maintenance activities. Maintenance intervals for 33 kV SF_6 switchgear are aligned with the four-yearly protection testing regime.
- Because Kaikohe is classified as a critical substation, the maintenance cycle for CB163612 was set at three-yearly intervals – one year shorter (more frequent) than the manufacturer's four-yearly recommendation – and Top Energy additionally performed circuit breaker timing tests beyond the manufacturer's specification.
- Ergo Consulting independently confirmed that Top Energy followed the manufacturer's instructions and *exceeded* the recommended maintenance schedule for this type of circuit breaker and found no evidence that asset lifecycle management (including replacement and renewal) was a root cause or contributing factor to the failure.

Conclusion. The replacement and renewal programme applicable to the affected switchgear was sufficient. The failure was a random internal fault in a maintenance-free sealed chamber rather than a consequence of insufficient renewal investment or deferred replacement. Ergo did note process improvement opportunities – completing all maintenance records with a named technician and formal sign-off. (see section 7).

5. Investigation, analysis and post-event review

Clause 12.6(e) – Any investigation, analysis or post-event review conducted of the extreme event

Top Energy initiated a comprehensive investigation programme immediately following the event. Four separate investigations and reviews have been completed. Their conclusions are consistent.

Investigation	Completed	Focus and key finding
ICAM Stage 1 – Equipment Failure (internal)	Jan 2026	Examined the full asset lifecycle of the failed circuit breaker from manufacture to failure. Found no action or omission by Top Energy caused the equipment failure; the most likely origin is an internal joint within the sealed SF_6 chamber.
ICAM Stage 2 – Customer Impact (internal)	Mar 2026	Examined why the failure caused a full busbar outage rather than a partial one. Identified the ILIS arc-flash wiring non-conformance dating to the 2013–2014

Investigation	Completed	Focus and key finding
		project, and gaps in commissioning oversight, documentation retention and consultant induction.
Schneider Electric forensic investigation (OEM)	Mar 2026 (full report May 2026)	Forensic examination with Top Energy and insurers present, plus independent third-party relay-data analysis. Confirmed correct maintenance, suitable environment, no abnormal network conditions, and correct upstream protection operation; definitive root cause inconclusive due to arcing damage.
Ergo Consulting independent review (external)	Jun 2026	Independent review of asset management and lifecycle practices and of the two ICAM investigations. Concluded the asset management system meets good industry standards and the failure was not due to inadequate asset lifecycle management; assessed the ICAM investigations as thorough and honest.

Internal Investigation and Review

ICAM Stage 1 — Equipment Failure (internal, completed January 2026)

- Incident Cause Analysis Method (ICAM) investigation into whether asset lifecycle management practices were the root cause of the catastrophic internal failure of the T3 incomer breaker (H05, CB163612). It examined the entire asset lifecycle — manufacture, installation, commissioning, maintenance, and operation.
- Led by an internal team (Technical Safety Engineer, Maintenance Engineer, Maintenance Manager, Performance Manager, and Protection/Automation & Controls Engineer). Methods included interviews with the OEM subject-matter expert, the commissioning engineer and the construction project manager, plus ADMS/RTU log and document review.

Key findings

- Maintenance was carried out in accordance with, and in excess of, Schneider Electric's recommended regime (three-yearly cycle for this critical site versus the four-yearly manufacturer recommendation, plus timing tests in FY24).
- Environment (temperature, humidity) was suitable and not a contributing factor.
- Operating history — the breaker had only 68 recorded operations, all normal load-current switching and never for interrupting fault current, well within its rated limits.

- Prior 31 October 2025 event — the fault that involved CB163612 days earlier was not of sufficient magnitude to have damaged the breaker and is considered unrelated to the 6 November failure.
- No co-incident network faults were present at the time of failure.
- Known GHA CT-bushing issues in earlier switchgear had already been rectified across the network and were ruled out as a cause.

Conclusion

- There were no failed or absent asset lifecycle management practices that contributed to the failure, and no meaningful action Top Energy could have taken — through commissioning, maintenance or operations — would have prevented it.

ICAM Stage 2 — Customer Impact (internal, completed March 2026)

- Investigation into why a single breaker failure caused a full busbar outage of ~23,000 customers rather than the partial (half-bus) outage expected of a switchboard fitted with bus-zone protection. Conducted by the same internal team as Stage 1.

Key findings

- On the night, all circuit breakers on both halves of the 33 kV bus tripped simultaneously, versus the ~1,900–2,000 customers that would have lost supply under the correct configuration.
- The cause was arc-flash protection wiring (ILIS) with the Bus A and Bus B trips connected together in the bus coupler panel — the manufacturer's default configuration — so a fault on either bus tripped both. This is contrary to Top Energy's protection design standard (trip A *or* B depending on fault location), introduced in 2010.
- A secondary wiring error on the DIS interlock release was also identified, which affected switching during the restoration effort.
- Demarcation of the 2013–2014 project — Schneider Electric was responsible for breaker panel setup, inter-panel wiring, busbar connection and basic commissioning; Northpower for final construction, secondary wiring, commissioning and testing; a Top Energy project manager oversaw the project, supported by an external consultant.
- As-built drawings on file were inconsistent, showing both standards; it could not be confirmed which standard the switchboard was commissioned and tested against, as the relevant records could not be located.
- The discrepancy remained undetected until the event; there is no maintenance regime to detect commissioning wiring errors post-commissioning, which is consistent with industry practice.

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- Restoration: Bus A wiring has since been corrected and tested; Bus B correction is outstanding and cannot be tested while in service.
- Alternate-scenario modelling (Appendix 9): under the correct configuration ~2,000 customers would have been affected initially, extending to ~21,000 for around one hour for safety isolation — an estimated 2,328,216 customer minutes and 66.20 SAIDI, within the extreme event limits.

Gaps identified

- The commissioning process at the time was not robust enough to detect the deviation from Top Energy's protection design standard.
- Project construction and commissioning documentation was not captured and stored appropriately after project completion.
- Technical induction and onboarding of external consultants/contractors at the time was insufficient.

Conclusion

- The scale of the outage — and the resulting extreme event breach — was caused by the non-conforming arc-flash wiring dating to the original project, not by the equipment failure alone.
- Several remedial actions were identified and are underway and reported to the board through the Network Improvement Programme.

External Investigation and Review

The following independent review of asset condition, asset management and operational practices, relevant to the assets and practices connected with the extreme event, was completed following the event by the manufacturer (Schneider) and another by Ergo Consulting.

Schneider Electric forensic investigation (May 2026) -

- Comprehensive forensic investigation by the equipment manufacturer into the CB163612 failure of 6 November 2025, covering maintenance history, environmental conditions, network behaviour, relay performance, and post-event physical inspection. Two detailed forensic inspections of the dismantled circuit breaker chamber were conducted at Schneider's Auckland workshop (11 and 20 January 2026), with Top Energy and its insurers present. Independent third-party analysis of the relay data was separately commissioned.

Findings by area

- **Maintenance** – All maintenance was completed in accordance with Schneider's best-practice regime for this class of equipment; no deviations, omissions, or overdue tasks were identified that could have contributed to the failure.
- **Environment** – The switchboard was housed in a conditioned indoor building; temperature, humidity, and contamination risk were all within acceptable limits and non-contributory.

- **Network conditions and protection** – No abnormal network conditions were present. Independent third-party relay analysis confirmed the immediate upstream circuit breaker operated correctly and cleared the fault within the required protection time limits, with no maloperation detected.
- **SF_6 gas system** – Measurements from the remaining panels recorded gas pressure of 100% and average purity of 97%, eliminating gas loss or degradation as a contributing factor.

Physical inspection of the failed breaker

- Internal inspection confirmed an internal arc, with extensive arcing damage between phase bars and earthed metalwork, decomposition of the SF_6 throughout the tank, and the safety membrane / pressure-relief disk displaced.
- Vacuum bottles were assessed as largely intact (broken on phases A and B, phase C solid), with no loose or poor-quality connections found, indicating the failure was not an attempted opening under fault.
- Schneider's working assumption was that the arc likely initiated outside the vacuum interrupters and inside the CB compartment (ceramic fragments leaned inward, suggesting external force), though the vacuum bottles being impacted by the event meant this could not be confirmed.

Root cause conclusion

- The level of arcing damage compromised the ability to identify the initiating event; despite extensive testing and forensic review, Schneider classified the root cause as **inconclusive**.
- The investigation confirmed that Top Energy's maintenance practices, the environment, network conditions, and protection systems were not contributors to the failure.

Ergo Consulting – Independent Review Report (June 2026), ref 25317-RPT-001.

- Top Energy engaged Ergo Consulting to provide an independent external review of its asset management practices and lifecycle management for the Kaikohe Schneider GHA switchboard, and to comment on the two internal ICAM investigations. Ergo reviewed Top Energy's asset management policy and strategy documentation, maintenance scheduling and inspection records, the 2014 commissioning test report, and alignment with the manufacturer's recommendations.
- Ergo concluded that Top Energy has the asset management system required to operate and maintain its switchgear assets in accordance with good industry standards, and that there is no evidence the failure was due to inadequate asset lifecycle management. (Author: Willem Rawlins; reviewed and approved by A. Williams, Ergo Consulting.)

In addition, Top Energy's asset condition and operational practices are documented in, and independently disclosed through, its Asset Management Plan (2026 issue), which is subject to the Commission's information disclosure requirements.

Supporting evidence. Copies of all investigations are found in the appendices as follows:

- Appendix 1 – ICAM Investigation Report: Equipment Failure (Stage 1)

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- Appendix 2 – ICAM Investigation Report: Customer Impact (Stage 2)
- Appendix 3 – Schneider Electric: Final Investigation Letter (March 2026)
- Appendix 4 – Schneider Electric: Full Investigation Report
- Appendix 5 – Ergo Consulting: Independent Review Report (June 2026)

Overall conclusions. The equipment failure was not caused by any action or omission on Top Energy's part, and its maintenance and asset management practices met and exceeded manufacturer and industry standards. The scale of the outage – and the resulting extreme event breach – was caused by arc-flash protection wiring installed to the manufacturer's default configuration rather than Top Energy's protection standard at the time of the 2013–2014 project, which remained undetected until the event.

The findings were presented to the Top Energy Board across three board papers (February, May and June 2026), and the consolidated close-out report was noted by the Board in June 2026. The investigations and the event log / alternate-scenario modelling are provided as appendices to the accompanying close-out report.

6. Planned future activities and Reviews

Clause 12.6(f) – Intended reviews, analyses or investigations meeting the categories in clauses 12.6(c)–(e) that are planned but not yet completed

The following actions are planned, directly related to this failure. A number of other actions have been identified as network improvement activities and can be found in Appendix 8

Planned review / action	Target
Network-wide check and correction of ILIS arc-flash and DIS interlock wiring on all other Schneider GHA/GMA switchgear (Ngāwha Transmission confirmed; remaining sites to be reviewed by external contractor Omexom from August 2026).	EoFY2027
Develop and document a more robust project commissioning process (roles and responsibilities, technical verification requirements, and document retention), with a consultant engaged.	EoFY2027
Critical spares review (consultant engaged, commenced June 2026).	July–August 2026

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7. Director's certificate

Clause 12.6(g) – A certificate in the form set out in Schedule 11, signed by at least one director of the non-exempt EDB

The following certificate is provided in the form set out in Schedule 11 of the Determination and is to be signed by at least one director of Top Energy Limited.

CERTIFICATE FOR EXTREME EVENT STANDARD REPORTING

Clause 12.6(g) – Schedule 11 form of certificate

We, **David Alexander Sullivan** and **Matthew Peter Todd**, being directors of **Top Energy Limited** certify that, having made all reasonable enquiry, to the best of my/our knowledge and belief, the attached extreme event standard reporting of **Top Energy Limited**, and related information, prepared for the purposes of the Electricity Distribution Services Default Price-Quality Path Determination 2025 has been prepared in accordance with all the relevant requirements.

The statement relates to the extreme event that occurred on 6 November 2025 at the Kaikohe 33 kV Zone Substation, being the catastrophic failure of Schneider Electric GHA-36-25-25 circuit breaker CB163612 (the T3 33 kV incomer, panel H05).

Signed:

______________________________	______________________________
Director	Director
Date: 25 August 2026	Date: 25 August 2026

Appendix A

Top Energy Limited
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To	**Directors**
CC	
From	**Russell Shaw**
Date	**12 June 2026**
Subject	**Schneider GHA Failure Close out report**

Purpose
To present the Board with the final close-out report of the circuit breaker failure that occurred at Kaikohe Zone Substation on 6 November 2025.
This paper is for information.

Material issues
The investigations – two internal ICAMs, an independent review by Ergo Consulting, and a forensic investigation by Schneider Electric – are now complete. The key findings are:

On the equipment failure:
- The circuit breaker failed due to an internal fault within its sealed SF_6 gas chamber. Schneider Electric conducted extensive forensic testing but could not determine a definitive root cause.
- Top Energy's maintenance exceeded the manufacturer's recommended regime. Ergo Consulting independently confirmed there is no evidence that asset management practices contributed to the failure.
- There were no meaningful actions Top Energy could have taken – through commissioning, maintenance, or operations – to prevent this failure.
- The asset is classified as 'maintenance-free' by the manufacturer. The fault originated within a factory-sealed chamber, inaccessible to either Top Energy or Schneider Electric's local teams.

On the scale of the customer outage:
- The full busbar outage – affecting all 23,000 customers – was caused by arc flash protection wiring that did not conform to Top Energy's design standard. The wiring connected Bus A and Bus B trips together, meaning a fault on either bus tripped both simultaneously.
- The wiring dates to the original 2013–2014 switchboard project and was consistent with Schneider Electric's default configuration, which differs

from Top Energy's standard. Whilst the configuration is technically compliant, it does not meet TEL protection standard.
- Inconsistent drawings from both parties contributed to the incorrect standard being used and undetected at commissioning.
- Under the correct protection configuration, only approximately 2,000 customers would have been initially affected. The broader isolation required for safety checks would have extended this to approximately 21,000 customers for around one hour – within the extreme event threshold.
- Bus A has been corrected and tested. Bus B correction is planned at the next available outage in FY2027.
- A network-wide check of all GHA and GMA switchgear is underway, with Ngāwha Transmission already confirmed and remaining sites planned for FY2027.

Process gaps identified and actions underway:
- Commissioning oversight at the time of the 2013 project was insufficient to detect the deviation from Top Energy's protection standard.
- Project documentation was not captured and stored appropriately.
- Technical induction requirements for external consultants was insufficient.

Background

At approximately 17:20 on 6 November 2025, a Schneider Electric GHA circuit breaker (CB163612) failed catastrophically at Kaikohe 33 kV Zone Substation. The failure caused an internal arc flash and a violent pressure release, blasting open the substation equipment doors.

23,000 customers lost supply for approximately 6.5 hours. No injuries were sustained. The event exceeded the Commerce Commission's quality standard threshold for extreme events, triggering a reporting obligation to the Commerce Commission by August 2026.

The Board has been updated on the investigation's progress through a series of papers presented between February and June 2026. The attached close-out report consolidates all findings from those investigations into a single final document..

Conclusion

All investigations into the Kaikohe circuit breaker failure are now complete. The findings are consistent across four independent workstreams: the failure was not caused by any action or omission on Top Energy's part.

The scale of the outage – and the resulting extreme event breach – was caused by using an industry commissioning wiring standard, not Top Energy's standard that dates back to 2013. The remedial actions are underway and are being tracked through the Network Improvement Programme.

The attached close-out report, together with its appendices, will support Top Energy's reporting obligations to the Commerce Commission.

The following actions were identified and are being progressed:

Action	Notes	Source	Due
Correct Bus A arc flash (ILIS) protection wiring at Kaikohe	Tested and verified	Restoration Activities	Complete
Correct Bus B arc flash (ILIS) protection wiring at Kaikohe	Cannot test live; planned in FY2027	Restoration Activities follow up	EoFY2027
Review written report with findings and outcomes of the detailed intrusive inspection conducted by the Original Equipment Manufacturer (OEM).	Schneider report received, attached Appendix 3 and 4	ICAM 1	Complete

Check and correct ILIS and DIS wiring on all other GHA/GMA switchgear across the network	Ngāwha Transmission complete. Remaining sites planned FY2027	ICAM 2, Network Reliability Report	EoFY2027
Develop and document robust project commissioning process	Includes roles, responsibilities, technical verification and document retention. Consultant engaged.	ICAM 2, Network Reliability Report	EoFY2027
Review consultant and contractor technical induction requirements	Records to be retained going forward	ICAM 2	EoFY2027
Complete assurance testing for more robust commissioning processes on all high-risk projects since 2013.		ICAM 2	EoFY2027
Update Network Asset Management Policy with review table and sign-off	As recommended by Ergo	External Report	October 2026
Improve maintenance record completeness and formal sign-off	This is current process, maintenance to validate completeness of reports on receipt.	External Report	Complete
Critical Spares Reviews	Consultant engaged, commenced June 2026.	Network Reliability Report	Jul-26

Recommendation

It is recommended that the Board accept this paper for information.

Russell Shaw
Chief Executive
Top Energy Ltd

Prepared by:
Claire Picking
GM Network

Appendices:

- Appendix: Final close out report
- Appendix 1: ICAM Investigation Report: Equipment Failure (Stage 1)
- Appendix 2: ICAM Investigation Report: Customer Impact (Stage 2)
- Appendix 3: Final Kaikohe GHA internal arc event
- Appendix 4: Final report March
- Appendix 4.1: Dinal report into the Kaikohe CB failure
- Appendix 5: TOP GHA CB Failure
- Appendix 6: Board Paper Feb 26 – Kaikohe CB Failure
- Appendix 7: Board Paper May 26 – Schneider GHA iCAMs
- Appendix 8: Network Improvement Board Papers
- Appendix 9: Southern Area Outage Alternate Scenario Modelling
- Appendix 10: Maintenance Records

AI supported the generation of this paper by providing:

☐ Proof reading
☒ Paper content generation
☒ Appendix content generation

I confirm that where AI has been used, the Company's AI policy has been complied with, and I have checked that the AI generated content is accurate and can be relied on.

☒ Appendices One was not generated by the Company, but we believe it is reasonable to rely on it.

Appendix A1

Appendix

TOP ENERGY LIMITED

Kaikohe Zone Substation

Circuit Breaker Failure – Final Close-Out Report

Event date	6 November 2025
Report date	15 June 2026
Site	Kaikohe 33 kV Zone Substation
Report author	Claire Picking, General Manager Network
Report status	Final – Incident Close-Out

Appendices

- Appendix 1 – ICAM Investigation Report: Equipment Failure (Stage 1)
- Appendix 2 – ICAM Investigation Report: Customer Impact (Stage 2)
- Appendix 3 – Schneider Electric: Final Investigation Letter (March 2026)
- Appendix 4 – Schneider Electric: Full Investigation Report
- Appendix 5 – Ergo Consulting: Independent Review Report (June 2026)
- Appendix 6 – Board Update – ICAM Stage1 + associated Appendix 6.1 (February 2026)
- Appendix 7 – Board Update - ICAM Stage 2 + associated Appendix 7.1 (May 2026)
- Appendix 8 – Network Reliability Update (March 2026 & Monthly)
- Appendix 9 – Event Log and Alternate SAIDI study
- Appendices 10 – Maintenance Records

1. Purpose

This report provides a final summary and close-out of the circuit breaker failure that occurred at Kaikohe Zone Substation on 6 November 2025.

It consolidates the findings from all investigations and reviews undertaken since the event and sets out the actions taken and planned to prevent recurrence.

It draws together:

- Two internal ICAM investigations – one into the equipment failure and one into the scale of the customer outage
- An independent review of Top Energy's asset management practices, conducted by Ergo Consulting

- The manufacturer's (Schneider Electric) final investigation report
- A series of board papers submitted between February and June 2026

This report is intended for the Board of Directors and regulators and will be publicly available as a disclosure document.

2. Background

2.1. The Kaikohe Substation

Kaikohe Zone Substation is one of Top Energy's critical sites. It supplies electricity to approximately 23,000 customers across the Kaikohe area and surrounding network.

The substation operates at 33 kV and is arranged as a standard closed-bus configuration. Two 110/33 kV transformers (T2 and T3) feed separate bus sections , separated by a bus coupler. This design means, under normal circumstances, a fault on one bus section should only affect half the substation while the other half remains in service.

2.2. The Equipment

The circuit breaker that failed (CB163612) is a Schneider Electric GHA-36-25-25, installed and commissioned in October 2014. It acts as the 33 kV incomer breaker for the T3 transformer (H05).

Make and model	Schneider Electric GHA-36-25-25
Serial / Asset number	CB163612
Commissioned	30 October 2014 (FY15)
Rating	2,500 A continuous; 25 kA / 3 seconds fault
Operations to date	68 – none for fault current interruption
Type	SF_6 gas-insulated, sealed-for-life circuit breaker

The GHA is described by Schneider Electric as 'maintenance-free' over its service life. The sealed gas chamber is not accessible for inspection or servicing by either the owner or the manufacturer's local service teams.

2.3. Events leading up to the failure

One week before the failure, on 31 October 2025, a tree branch fell onto the 33 kV network near Mount Pokaka, causing a phase-to-phase fault. The fault was cleared in approximately 3 seconds via transformer protection at Kaikohe.

The fault currents recorded (716–738 A) were a fraction of CB163612's rated capacity.

Our investigation, and that of Schneider Electric, concluded that this event was not connected to the subsequent circuit breaker failure.

3. The Event: 6 November 2025

3.1. What happened

At approximately 17:20 on Thursday, 6 November 2025, CB163612 failed catastrophically at Kaikohe substation.

The failure caused:

- An internal arc flash – an extremely high-energy electrical discharge inside the sealed breaker chamber
- A sudden, violent pressure release – the force was sufficient to blast open the substation equipment doors and damage the door latching mechanisms
- The entire 33 kV busbar to trip, cutting supply to all customers fed from the substation
- 23,000 customers lost electricity supply for approximately 6.5 hours.
- No injuries were sustained. The on-call fault response team acted promptly and safely – they proactively ventilated the building before entering, given the vapour present.

3.2. Immediate response

- Fault response was dispatched immediately
- Building was ventilated before entry as a precaution
- The affected half of the 33 kV bus (Bus A) was isolated
- The healthy half (Bus B) was restored as quickly as safely possible
- Supply to all customers was restored within approximately 6.5 hours
- Repairs and full restoration of the substation were completed using a replacement circuit breaker panel

4. Investigations and Reviews

Four separate investigations and reviews have been completed:

4.1. ICAM Stage 1 – Equipment Failure

Completed: January 2026

Led by: Internal investigation team (Technical Safety Engineer, Maintenance Engineer, Maintenance Manager, Performance Manager, Protection, Automation & Controls Engineer)

This investigation looked at the entire life of the circuit breaker – from manufacture through to the moment of failure. It covered installation, commissioning, maintenance, and operation.

Key findings:

- Maintenance was carried out in accordance with, and in excess of, Schneider Electric's recommended regime.
- The substation environment (temperature, humidity) was suitable and not a contributing factor
- The circuit breaker had only 68 operations registered – well within its rated operational limits, with no fault current interruptions in its history

- The fault on 31 October 2025 was not of sufficient magnitude to have damaged the circuit breaker
- There were no co-incident network faults at the time of the failure
- Known issues with CT bushings in earlier GHA switchgear had been rectified across the network and were ruled out as a cause

> **ICAM Stage 1 Conclusion**
> - There were no failed or absent asset lifecycle management practices that contributed to this failure.
> - There were no meaningful actions Top Energy could have taken – through commissioning, maintenance, or operations – to prevent this failure.

Note on commissioning records: The investigation found that no commissioning test reports from the original 2014 project could be initially located within Top Energy's systems. This was identified as a process gap. Ergo's independent review subsequently found an installation and commissioning test report that confirms the switchboard was correctly commissioned and safe to energise.

4.2. ICAM Stage 2 – Customer Impact

Completed: March 2026

Led by: Same internal investigation team as ICAM Stage 1 – Equipment Failure

On the night, all circuit breakers on both halves of the bus tripped simultaneously – affecting all 23,000 customers on the Southern network rather than the 1,900 that would have lost supply under the correct protection configuration.

Under Top Energy's protection design standard (introduced 2010), a fault on one half of the bus should only trip that bus section. The healthy section of bus should remain in service.

Even under the correct protection configuration, Top Energy would still have needed to isolate the entire busbar at Kaikohe during fault response for safety checks. By that stage, supply to about 1,900 customers would already have been restored using the Omanaia generators. The remaining impact would therefore have been limited to the residual 21,100 customers, for approximately one hour rather than 6.5 hours.

Based on the assumption that:

- *The bus and circuit breaker indication would have opened all breakers on LH bus, and bus coupler, leaving all breakers on the RH bus closed.*
- *The bus coupler protection would have operated 16:36:58 isolating the right-hand side of the Kaikohe 33kV from the fault.*
- *Differential Protection would have isolated CB0101 at Kaikohe,*
    - *093302 Circuit Breaker at Worsnop would have also resulted in operation of 160132 on the 110 kV at Kaikohe, resulting in Top Energy maintaining power on the 33kV Ring*
    - *T2, the second 110 kV transformer, at Kaikohe would have remained on.*
    - *Only Omanaia Substation and Ngawha's OEC3 would have lost power (OEC1 and OEC2 being out for maintenance)*
- *Omanaia would have been brought online in the short term via back-feeding from Kaikohe's Taheke Feeder, combined with voltage support from the Omanaia Generators.*
- *Before entering the 33 kV Substation, for safety checks the entire 33 kV Switchboard, supplying the Southern Network, would have been isolated for one hour.*

- *This being the case, Network Control would have established generator island mode at Omanaia substation to retain supply to the 1,900 plus customers supplied from that substation while the Kaikohe sub station RHS bus was also removed from service*

Our estimated customer impact would have been:

- **2,328,216 customer minutes** – under the extreme event limit of 6 million
- **66.20 SAIDI** – under the extreme event limit of 120 mins

Refer to Appendix 9 for details.

This investigation focused on why the fault resulted in a full busbar outage affecting all 23,000 customers, rather than a partial outage as the protection design intended, as this discrepancy resulted in an Extreme Event Breach, rather than the equipment failure alone.

Key findings:

- The arc flash protection wiring (ILIS system) at Kaikohe was wired with Bus A and Bus B trips connected together in the bus coupler panel
- This is contrary to Top Energy's Network Protection Design Standard ST-A6.3.1-001, introduced in 2010
- The switchboard was built and wired in line with Schneider Electric's standard default configuration – which differs from Top Energy's design standard stated above.
- Multiple drawings (from both Schneider Electric and Top Energy) show inconsistent configurations
- It could not be confirmed which standard the switchboard was originally commissioned and tested against – relevant records could not be located
- A secondary wiring error with the DIS interlock release was also found, which impacted switching during the restoration effort
- The Bus A wiring has since been corrected and tested. Bus B correction is awaiting the next available planned outage

2013 Kaikohe project responsibility demarcation

- Schneider Electric were responsible for completion of the circuit breaker panel setup, inter-panel wiring, busbar connection and basic commissioning.
- Northpower were responsible for final construction and commissioning, including secondary wiring, final commissioning and testing.
- A Top Energy Project Manager was responsible for overseeing the entire project, with a consultant Project Manager engaged to support and oversee commissioning.
- External consultant resources are used to support project management and commissioning for complex projects where the specialist skills or capacity required are not held in-house, which is common practice across the electricity distribution industry for infrequent, technically demanding substation works.

Stage 2 ICAM Conclusion

- Investigation found that the arc flash protection wiring at Kaikohe had been installed with Bus A and Bus B trips connected together, contrary to Top Energy's design standard.
- This meant a fault on either bus would trip both buses simultaneously.

- The wiring was consistent with Schneider Electric's default manufacturer configuration, but not with Top Energy's protection standard.
- The discrepancy dates back to the original switchboard project in 2013–2014.
- Inconsistent drawings – from both Schneider Electric and Top Energy – contributed to the error not being detected at the time.

Gaps identified by Stage 2 ICAM

- The commissioning process at the time of the 2013 project was not robust enough to detect the deviation from Top Energy's protection standard
- Project construction and commissioning documentation was not captured and stored appropriately after project completion
- External consultant staff engaged at the time were not adequately inducted into Top Energy's technical standards

4.3. Schneider Electric Investigation

Report completed: March 2026 (letter); full report provided May 2026

Led by: Schneider Electric, with Top Energy and its insurers present for physical inspections. Independent third-party analysis of protection relay data was also commissioned.

Key findings:

- Maintenance was in accordance with Schneider Electric's best-practice regime
- The switchboard was housed in a suitable, controlled indoor environment
- No abnormal network conditions contributed to the failure
- Upstream protection operated correctly and within required time limits (confirmed by independent third-party relay analysis)
- SF_6 gas pressure and purity across the remaining switchboard panels were within acceptable parameters – gas degradation or loss was not a factor
- Physical inspection of the failed breaker chamber showed vacuum bottles largely intact with no loose connections, however severe arcing damage made the exact initiating cause inconclusive

Schneider Electric Conclusion

- Despite extensive testing and forensic review, the investigation was unable to determine a definitive root cause for the failure.
- Top Energy's maintenance practices, network conditions, and protection systems were not contributors.

Note: Top Energy's technical representative who was present during the inspections noted that Schneider's finding of 'vacuum bottles largely intact and no loose connections' does not fully align with Top Energy representatives observations made on the day. Specifically, significant arcing damage was found on the L1 phase current path at a connection point deep within the breaker mechanism – a joint that is not user-serviceable and has been enclosed in the sealed SF_6 chamber since manufacture. In the opinion of Top Energy Engineering team, this internal connection point remains the most likely origin of the failure.

4.4. Ergo Consulting – Independent Review

Report completed: June 2026 (Draft B – for Top Energy review)

Author: Willem Rawlins; Reviewed and approved by: A. Williams, Ergo Consulting

Top Energy engaged Ergo Consulting to provide an independent external review of Top Energy's asset management practices and lifecycle management for the Kaikohe switchboard, and to comment on the two internal ICAM investigations.

Key findings:

- Top Energy has the required asset management system in place to ensure switchgear assets are operated and maintained in accordance with good industry standards
- Maintenance schedules are set at three-yearly intervals – more frequent than the manufacturer's four-yearly recommendation – reflecting Kaikohe's status as a critical substation
- Maintenance records for FY21 and FY24 were verified, and returned no actionable corrective items
- Although the first maintenance cycle (FY18) was missed, Ergo does not regard this as significant given the age and reputation of this type of circuit breaker, and because it entails visual inspection only
- Top Energy's maintenance activities exceeded the manufacturer's specification, including conducting circuit breaker timing tests during FY24
- A commissioning test report from 2014 was located and confirms the switchboard was commissioned correctly and safely
- The ICAM investigations are assessed as thorough, honest, and appropriate in their findings and recommendations

Ergo Consulting Conclusion

- There is no evidence that the failure of CB163612 was in any way due to the lack of, or inadequate, asset lifecycle management practices.
- Ergo is satisfied that Top Energy followed the manufacturer's instructions and exceeded the recommended maintenance schedule.
- The ICAM investigations confront the commissioning shortcomings directly and honestly. The value lies in implementing the recommendations in a timely manner, overseen at a sufficiently senior level.

Ergo also made the following recommendations for improvement:

- The Network Asset Management Policy should be updated to include a formal review table and CEO sign-off section
- All maintenance records should be comprehensively completed, formally dated, and signed by the responsible persons

5. Regulatory Obligations

The 6 November event exceeded the quality standard threshold for extreme events under the Commerce Commission's electricity distribution information disclosure requirements.

Top Energy is required to submit a report to the Commerce Commission by August 2026.

This close-out report, together with its appendices, provides the underlying evidence and findings that will support that submission.

6. Overall Conclusions

Four separate investigations and reviews have now been completed. Their conclusions are consistent.

On the cause of the equipment failure

- The circuit breaker failed due to an internal fault within the sealed SF_6 gas chamber.
- Despite extensive forensic investigation by Schneider Electric, the definitive root cause could not be determined.
- There is no evidence that Top Energy's maintenance, operations, or commissioning practices contributed to the failure.
- Top Energy's asset management practices met and exceeded manufacturer and industry standards.

On the scale of the customer outage

- The full busbar outage – affecting all 23,000 customers for 6.5 hours – was caused by arc flash protection wiring that did not conform to Top Energy's design standard.
- The wiring dates back to the original 2013 switchboard project and remained undetected until the event.
- It is not standard industry practice to check for in-service wiring errors after commissioning.
- The root cause was inadequate commissioning oversight and documentation management at the time of the original project.
- Under the correct protection configuration, approximately 2,000 customers would have been affected initially, with the full busbar isolation (21,000 additional customers) required for approximately one hour for safety checks.

The investigations have been conducted thoroughly and in good faith. The findings have been accepted by the executive team. The remedial actions are underway and will be completed and reported against.

This report formally closes the Kaikohe circuit breaker failure incident.

7. Remedial Actions and Progress

7.1. Actions

The following actions were identified and are being progressed:

Action	Notes	Source	Due
Correct arc flash (ILIS) protection wiring at Kaikohe	Tested and verified	Restoration Activities	Complete
Review written report with findings and outcomes of the detailed intrusive inspection conducted by the Original Equipment Manufacturer (OEM).	Schneider report received, attached Appendix 3 and 4	ICAM 1	Complete

Check and correct ILIS and DIS wiring on all other GHA/GMA switchgear across the network	Ngāwha Transmission complete. Remaining sites planned FY2027	ICAM 2, Network Reliability Report	EoFY2027
Develop and document robust project commissioning process	Includes roles, responsibilities, technical verification and document retention. Consultant engaged.	ICAM 2, Network Reliability Report	EoFY2027
Review consultant and contractor technical induction requirements	Records to be retained going forward	ICAM 2	EoFY2027
Complete assurance testing for more robust commissioning processes on all high-risk projects since 2013.		ICAM 2	EoFY2027
Update Network Asset Management Policy with review table and sign-off	As recommended by Ergo	External Report	October 2026
Improve maintenance record completeness and formal sign-off	This is current process, maintenance to validate completeness of reports on receipt.	External Report	Complete
Critical Spares Reviews	Consultant engaged, commenced June 2026.	Network Reliability Report	Jul-Aug 26

A summary of the remedial actions progress will be reported to the board on a monthly basis.

Appendix 1

Incident Title:	
ME 28155 Kaikohe 33 kV switchboard fault	
Incident Date:	*Incident Time:*
Thursday, 6 November 2025	17:20
Company:	*Site:*
Top Energy	Kaikohe

Description of HSE Incident: (Who, what, how, when)

On 6 November 2025 @ +/- 17:20 there was an unexpected, catastrophic, internal failure of T3 incomer breaker H05 (CB163612) at the Top Energy Kaikohe 33 kV substation. A subsequent loss of supply to 23 000 customers for about 6.5 hours was experienced.

This ICAM investigation report specifically focuses on this catastrophic, internal failure of the T3 incomer breaker H05 (CB163612) at the Top Energy Kaikohe 33 kV substation. The subsequent loss of supply to 23 000 customers for about 6.5 hours are related but dealt with as part of a separate ICAM investigation and report.

This Top Energy ICAM investigation excludes any physical inspection or analysis detailed commentary of the failed T3 incomer breaker H05 (CB163612) since a detailed comprehensive (intrusive, extensive testing and forensic) investigation has been conducted by Schneider Electric, led by a technical expert appointed by Top Energy's insurer and witnessed by representatives of Top Energy.

This ICAM considers the entire asset lifecycle of the failed T3 incomer breaker H05 (CB163612) at the Top Energy Kaikohe 33 kV substation from manufacture, installation, commissioning, maintenance and operation, through to the moment of failure on Thursday, 6 November 2025 @ +/- 17:20.

<u>Manufacturing, Installation and Commissioning:</u>

When considering manufacturing, installation and commissioning, the failed T3 incomer breaker H05 (CB163612) is of Schneider Electric make, type GHA-36-25-25, manufactured in 2014 and commissioning in service on 30 October 2014 (thus installed in FY15). Schneider Electric is a global energy technology leader with a proven manufacturing record; hence Top Energy had no oversight of the manufacturing process, nor was it deemed necessary due to Schneider Electric's highly regarded standing as a market leader.

Installation and commissioning of the 33 kV switchgear at Kaikohe substation was performed by an experienced third-party contractor appointed by means of a NZS 3910 built contract, under the guidance and close supervision of a Schneider Electric commissioning technician and project managed by an externally appointed construction and commissioning project manager acting on Top Energy's behalf. The Schneider Electric commissioning technician were present from unboxing of the switchgear through to pre-commissioning tests, which included setting out, bolting down, busbar connection and inter-panel wiring.

Unfortunately, at the time of conducting this ICAM investigation and report compilation, no final commissioning test reports or results could be located. There is however no evidence that illustrates that the T3 incomer breaker H05 (CB163612) could have been compromised by incorrect installation or commissioning practices.

<u>Maintenance:</u>

Moving on to the maintenance life cycle details, according to the Schneider Electric GHA Operation – Maintenance Technical Manual the GHA series panels have a hermetically sealed pressure system and does not require servicing over its entire service life. Greasing of drives and checking of releases/blocking coils have a recommended service interval 'after 20 years'. Revision or replacement of a switchgear panel are only recommended once the maximum admissible number of breaking operations for the vacuum interrupters has been reached or after 2000 operations of the disconnector or earthing switch.

Top Energy's standard asset maintenance strategy for circuit breakers is 4 yearly – this aligns with the protection relay testing strategy. As Top Energy deems the Kaikohe 33 kV substation a critical site, the maintenance plan for the 33kV panel maintenance was set up to be a 3 yearly frequency which involves visual checks and an operational timing check carried out during the protection relay testing.

At the time of setting maintenance plans and budgets for FY18, the as-builds for the Kaikohe 33 kV substation were submitted but not yet fully processed by Maintenance. On 23 March 2018, being just days from the end of FY18 the maintenance plan was set up, but the opportunity for executing it in the FY18 maintenance cycle was missed. Thereafter no further maintenance cycles were missed; and inspection, maintenance and test records for the failed T3 incomer breaker H05 (CB163612) are available for FY21 & FY24. These records returned no actionable corrective items for this breaker in question.

The circuit breaker maintenance and test records for the FY21 maintenance cycle for the maintenance performed on 10 December 2020 shows that a local check for low gas pressure was recorded. As for the FY24 maintenance cycle, the circuit breaker maintenance and test records for maintenance conducted on 11 July 2023 shows that a local check for low gas pressure was not recorded. The maintenance and inspection records do not record the integrity of the SF_6 gas in the chambers. At the time of restoring the affected half of the 33 kV switchgear and power supply post fault event, the integrity of the SF_6 gas in the chambers of switchgear panels H01 to H08 was confirmed.

The climatic conditions (ambient temperature and humidity) inside the Kaikohe 33 kV substation building as observed during maintenance cycles also pointed to nothing that could have contributed to the failed T3 incomer breaker H05 (CB163612).

The historic CT bushing type failures that were experienced with these Schneider Electric GHA switchgear were considered and ruled out as a root cause for this specific incident since this type of failure was addressed for all Schneider Electric GHA switchgear on the Top Energy network through applying improved cable clamping methods as recommended by Schneider Electric. Also, since there was no arc detection protection activated from within the cable compartment, it's a clear indication that this is not where the fault originated. CTs from the failed panel were tested, confirmed to be healthy and put back into service in the replacement circuit breaker panel. A visual examination of the CT bushings confirmed no cracks, arcing or other deterioration.

Operation:

On 6 November 2025, T3 incomer breaker H05 (CB163612) only had 68 operations registered, of which none were for breaking fault current. There was one 'fault' operation recorded for 8 Nov 2014, but this a protection fault brought about by a wiring error of the Kaikohe T3 Transformer Differential Relay. No Fault currents were experienced for this incident. The Kaikohe T3 Transformer Differential relay is of a type that does not natively cater for the transformer vector group, and the original wiring of the secondary current inputs had been rotated 120 Degrees to compensate. This had not been replicated when the 33kV Outdoor-to-Indoor switchgear conversion took place, and the wiring fault did not present until a particular 33 kV load vs 33 kV generation situation occurred, creating a false transformer winding differential, and consequently tripping normal load current.

The failed T3 incomer breaker H05 (CB163612) is rated at 2500 A (continuous) and 25 kA/3 s (fault condition).
The week prior, on 31st October 2025 there was a 33 kV network fault event on the Mount Pokaka - Worsnops 33 kV section of the circuit supplied from the Kaikohe 33 kV Bus in a ring configuration. This was a Phase-to-Phase fault, across 'B' and 'C' phases, caused by an overhanging tree branch that fell onto the line. The fault currents recorded for this specific fault event were in the region of 716-738 A, with a negative-sequence component of 1240 A, proportionally shared in source (not equally) between Kaikohe T2 110/33kV Transformer, Kaikohe T3 110/33kV Transformer, and Ngawha Generation via KOE 163592 & KOE 163702 Circuit Breakers, hence reducing its fault event impact even further. This level of fault current is similar to other faults experienced on the Top Energy 'Southern' 33 kV Network. This fault event was unusual in the sense that it was cleared in an unexpected manner via the Kaikohe T2 & T3 Transformer HV (110kV) protection, instead of by its feeder circuit breaker, resulting in slightly extended delays amounting to a final fault clearance time of 3 seconds. Having said that, due to its almost negligible fault current magnitude compared to the rated value, it was not a fault that would normally be causing lasting damage to a circuit breaker panel. From a protection scheme and philosophy perspective, we therefore do not consider this fault of 31 October to be connected or correlated to the event of the 6 November.

The Kaikohe 33 kV Switchboard is operated as a standard 'H' bus, with two busbars separated by a bus coupler circuit breaker; each busbar supplied from one of the two 110/33 kV supply transformers.
Each 33 kV Transformer Incomer has standard Overcurrent and Earth Fault elements, allowing for the capacity of the respective transformers, and the usual margin of 1.2-1.5x full-load-current to allow for fault discrimination.
Immediately prior to the fault, normal load currents were observed typical of the time of day:

- KOE3572 (Local Service Transformer 1) = CB Closed, approximately 0 A (other LST on load)
- KOE3582 (Feeder to Omanaia) = CB Closed, approximately 13 A
- KOE3592 (Feeder to Ngawha 2) = CB Closed, approximately 1 A (Ngawha Generation on Outage)
- KOE3602 (Feeder to Worsnop) = CB Closed, approximately 100 A
- KOE3612 (Incomer from T3 110/33kV Supply Transformer) = CB Closed, approximately 211 A
- KOE3622 (Feeder to Ripple Plant) = CB Closed, approximately 18 A
- KOE3632 (HV Incomer to T11 33/11kV Zone Transformer) = CB Closed, approximately 25 A
- KOE3658 (33kV Bus Coupler) - CB Closed
- KOE3662 (HV Incomer to T12 33/11kV Zone Transformer) = CB Closed, approximately 23 A
- KOE3672 (Feeder to Wiroa) = CB Closed, approximately 85 A
- KOE3682 (Incomer from T2 110/33kV Supply Transformer) = CB Closed, approximately 125 A
- KOE3692 (Feeder to Moerewa) = CB Closed, approximately 61 A
- KOE3702 (Feeder to Ngawha 1) = CB Closed, approximately 1 A (Ngawha Generation on Outage)
- KOE3712 (Local Service Transformer 2) = CB Closed, approximately 1 A

Protection elements set on T3 33 kV incomer breaker H05 (CB163612) were the suite of Overcurrent and Earth Fault elements traditionally used for Supply Transformer 'Low voltage' side protection, using a SEL-351S multifunction relay:

- TRIP := 51P1T or 67N1T or 67P2T or IN103, where
- 51P1T = Inverse-Time Overcurrent, non-directional, 1176A pickup, Curve IEC 'SI', time multiplier 0.22

- 67N1T = Definite-Time Neutral (Earth) Fault, non-directional, 120A pickup, 85 cycles / 1.7 s delay
- 67P2T = Definite-Time Phase Overcurrent, 'Forward' (towards the Transformer), 876A pickup, 45cycle/0.9s delay (this element for protection from backfeed from NGA Generation into the transformer)
- IN103 = Intertrip from HV or Transformer Differential Protection

Moment of failure:

At 17:20:09.232h, the Relay evaluated the A-phase and B-phase currents as being above the preset settings for an overcurrent fault, and timing started for the issue of a TRIP.

Shortly after the Currents raised, the ILIS Arc-Flash Bus signalling 'lit up' indicating into the SEL-351S7 relay

Time (NZDT)	Signal
17:20:09.232	The 'Fault' started – phase currents raised above previous load (51P1 element picked up)
17:20:09.246998	Arc-Flash Bus signal indicated into the relay (IN202)
17:20:09.266994002	'Earth Fault' element 50N1 picked up
17:20:09.331981006	'CB Closed' indication from the switchgear into the relay, drops off; 'CB Open' indication asserts
17:20:10.250	TRIP Asserted (51P1T timed out); OUT101 (Trip output from Relay) closes to trip the CB
17:20:10:54094	Fault currents extinguished (51P1 dropped off)

Note that the timeline indicates that the CB indicated OPEN prior to the SEL-351S relay issuing the trip – it is presumed that the CB reacted to the ILIS Trip signal.

There is no evidence to suggest that a co-incident fault was occurring elsewhere on the Kaikohe 110 kV or 33 kV networks at the same time as the fault recorded for T3 incomer breaker H05 (CB163612).

During on-site fault response on 6 November 2025, shortly after the T3 incomer breaker H05 (CB163612) failure, it was observed that its arc flash (ILIS) protection system indicated that it detected an arc flash in the circuit breaker and busbar chambers. The circuit breaker's density monitoring (IDIS) protection system indicated detection of a pressure release in the circuit breaker chamber, pointing to a loss of SF6 insulation medium. This pressure release vented as per design through the pressure relief caps at the rear top of the circuit breaker chamber and was of sufficient force to blast the substation equipment doors open and damaging the door latching mechanisms.

No pressure release was detected for the busbar chamber and the pressure release caps for the busbar chamber remained intact. Gas pressure in the busbar chamber remained healthy when verified 15/1/2026.

Conclusion:

Given all the above investigation considerations, this Top Energy ICAM investigation concludes that the unexpected, catastrophic, internal failure of T3 incomer breaker H05 (CB163612) at the Top Energy Kaikohe 33 kV substation was not as a result of failed or absent asset lifecycle management practices as the root cause.

Top Energy has since received Schneider Electric's final report with key findings of their comprehensive investigation (intrusive, extensive testing and forensic) which focused on maintenance history, environmental conditions, network behaviour at time of event, protection relay response and post-event equipment inspection. Their key findings confirm that:

- The equipment was maintained in accordance with Schneider Electric's best-practice maintenance regime.
- The switchboard was housed in a controlled, suitable indoor environment.
- No abnormal network conditions contributed to the failure.
- Independent third-party analysis of the relay data verified that the upstream protection operated correctly and within required time limits.
- SF_6 gas pressure and purity across remaining panels were within acceptable parameters, eliminating gas degradation or loss as contributing factors.
- Physical inspection of the failed circuit breaker chamber showed vacuum bottles largely intact and no loose connections; however, severe arcing damage made the exact initiating cause inconclusive.

It has to be stated that Schneider Electric's last finding in relation to "showed vacuum bottles largely intact and no loose connections" does not fully align with the findings of Top Energy's technical representative who was present during the detailed, comprehensive investigations.'

Schneider Electric concluded that "despite extensive testing and forensic review, the investigation was unable to determine a definite root cause for the failure".					
Details of Injury/Damage/Impact: (Nature and extent of injuries/damage/impact)					
Unexpected, catastrophic, internal failure of T3 incomer breaker H05 (CB163612) at the Top Energy Kaikohe 33 kV substation.					
Immediate Actions Taken by Line Management following Incident:					
Fault response dispatched. Response proactively ventilated a smoke-like vapour from sub before entering. Protection indications pointed to an arc flash and pressure release for the bus chamber and switchgear chamber of the affected breaker. As a result, fault response isolated affected half of the 33 kV bus, restoring the other half.					
Employee, Contractor and/or Third Party Incident? Employee and contractor			All Top Energy Staff		
Work category of person injured or involved Specialist/Engineer/Scientist			Click here to enter text.		
Is the activity Controlled, Monitored or Uncontrolled?	Monitored	*Was a risk assessment conducted for this task? Yes/No*	Yes	*Does a site standard or procedure exist to control this risk? Yes/No*	No
ACTUAL – Incident type and consequence Assets/Operations S6-L1 & Reputation S5-L1			*POTENTIAL – Incident type and consequence* Assets/Operations S6-L1 & Reputation S6-L1		
View the Top Energy Group Risk Matrix when selecting the severity rating ([SS05-04-S3005S - Risk Matrix])					
☐H ☒S ☐E	*Select severity rating* Level 5		☐H ☒S ☐E	*Select severity rating* Level 6	
Was this a repeat incident?	No	*Was this incident a Process Failure?*	No	*Property damage Amount*	$1.5m
Investigation Team *Leader: Jacques Brown* *Members: Andy Rogerson, Russell Fernandes, John Williams, Tony Smallman*			*Is the incident a result of an unidentified risk?* ☒ No ☐ Yes. Review and add to risk register		
Investigation Methodology *(Please indicate all methods deployed to collect the data including:* • *interviews (please mention the names of the individuals interviewed;* • *site visits,* • *document review; and,* • *any other means*			*Interviews: OEM SME, Commissioning Engineer, Construction Project Manager* *ADMS logs* *RTU logs* *Document Review*		
Matters that were investigated (and the limits of the investigation, including what was outside the scope of the investigation) – copy relevant section from [SS08-09-001S - ICAM Terms of Reference] in opposite window			• *Attempt to identify whether failed or absent asset lifecycle management practices are the root cause of the unexpected, catastrophic internal failure of T3 incomer breaker (H05, CB163612).* • *Any related incidents or previous investigation, actions or findings.*		
Status of Investigation? Preliminary			*Date investigation completed* Friday, 23 January 2026		

Absent or Failed Defences	*Absent or Failed*	*Details*
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Individual/Team Actions	*Absent or Inadequate*	*Details*
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Task/Environmental Conditions (Workplace)	*Level of impact*	*Details*
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Task/Environmental Conditions (Human)	*Level of impact*	*Details*
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Organisational Factors	*Contributing*	*Details*
Choose an item.	☐	
	☐	
	☐	Click here to enter text.
Choose an item.	☐	Click here to enter text.

Permanent Corrective Actions to be Taken: (Actions should relate back to ICAM investigation findings)

Action	Hierarchy of Control Type	Responsible Person/Job Title	Due Date
Review written report with findings and outcomes of the detailed intrusive inspection conducted by the Original Equipment Manufacturer (OEM).	Level 1: Eliminate the Hazard	Andy Rogerson	Click here to enter a date.

Key Learnings: (Summary of learnings from incident)

Establish

Responsible Line Manager:	Click here to enter text.	*Title:*	Click here to enter text.
Telephone:	Click here to enter text.	*Email:*	Click here to enter text.

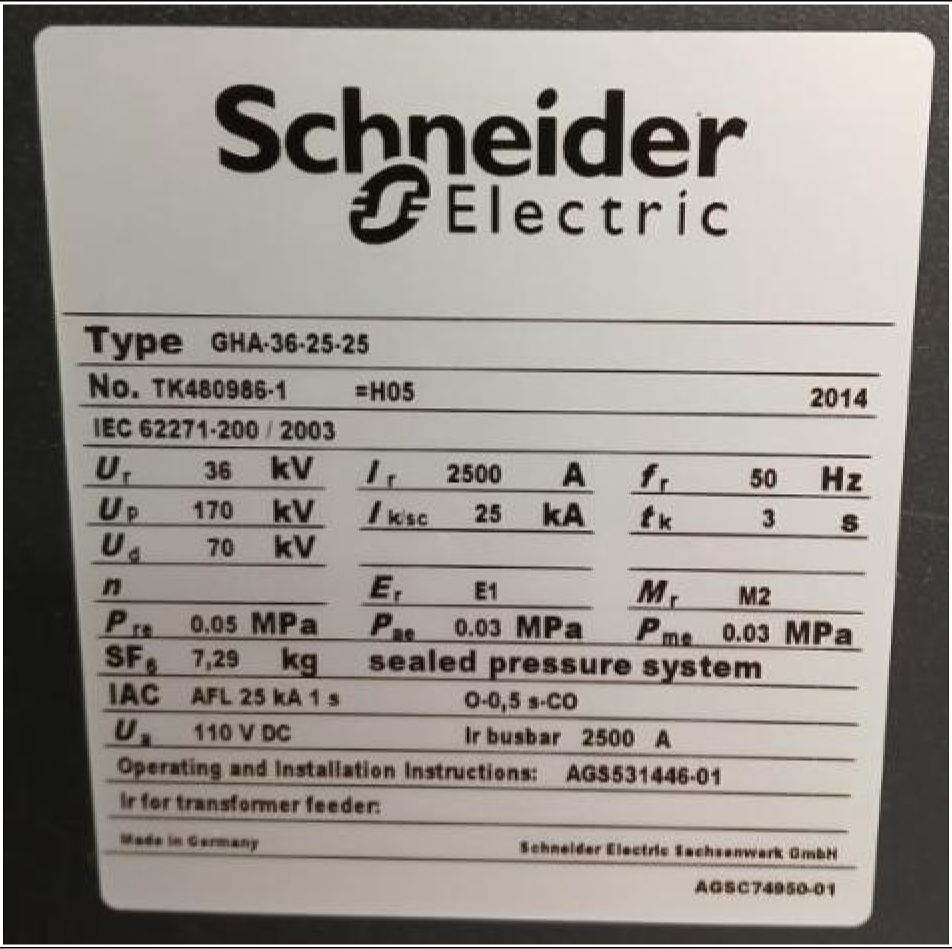

Fig 1: Nameplate for T3 incomer breaker H05 (CB163612)

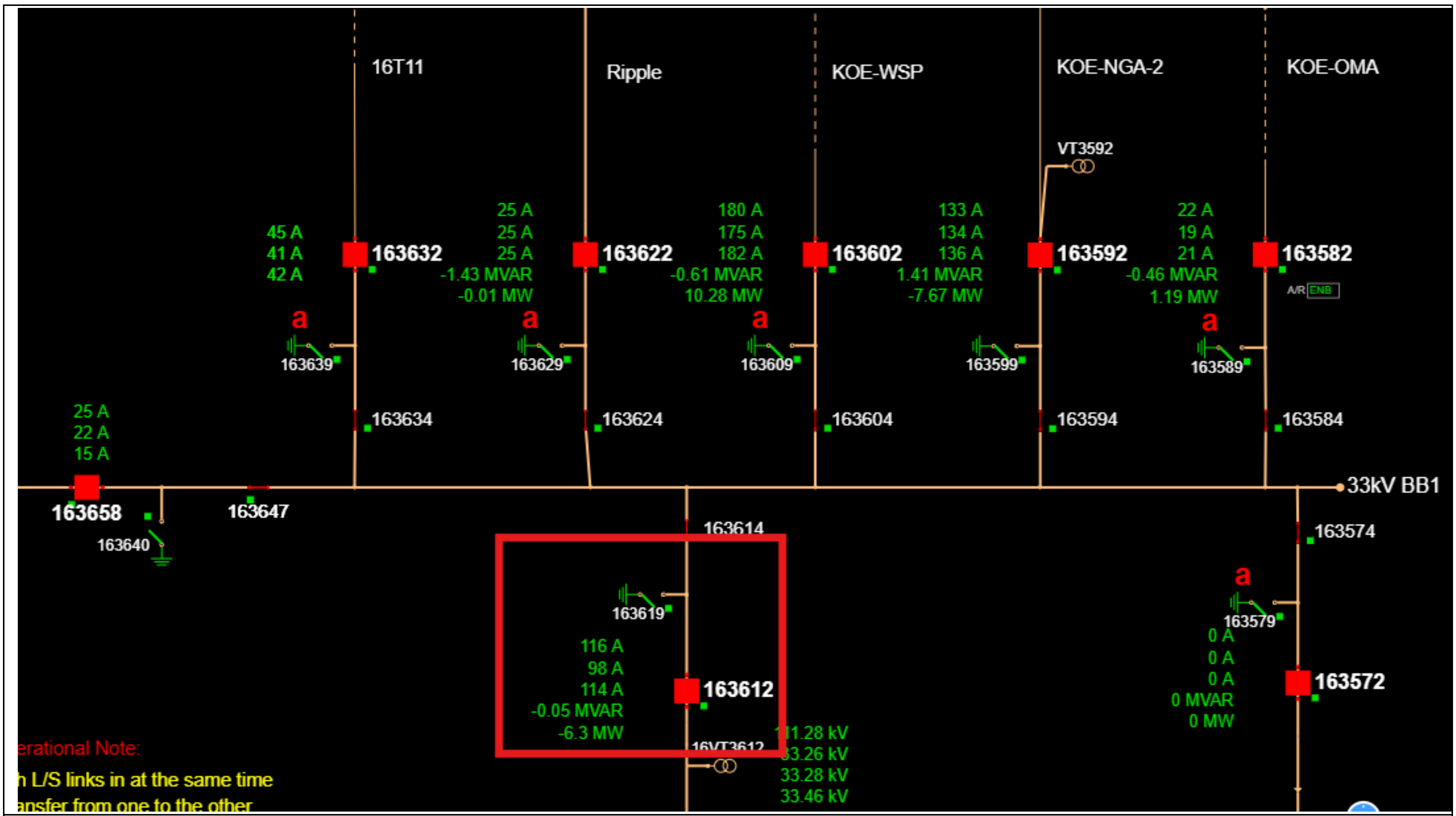

Fig 2: SLD from SCADA with H05 (CB163612) in the red block

Fig 3: ILIS protection indication for T3 incomer breaker H05 (CB163612)

Fig 4: IDIS protection indication for T3 incomer breaker H05 (CB163612)

Fig 3:

Appendix 2

Incident Title:	
ME 28155 Subsequent loss of supply to 23000 ICPs due to Kaikohe 33 kV switch board fault 6 Nov 2025	
Incident Date:	*Incident Time:*
Thursday, 6 November 2025	17:20
Company:	*Site:*
Top Energy	Kaikohe
Description of HSE Incident: (Who, what, how, when)	

<u>Executive Summary</u>

On 6 November 2025 at approximately 17:20, the T3 incomer circuit breaker (H05, CB163612) at Kaikohe 33 kV substation failed catastrophically causing ~23,000 customers to lose supply for around 6.5 hours.

The pressure release from the failure was sufficient to blast open the substation equipment doors and damage the door latching mechanisms. The event caused the entire 33 kV bus to trip, rather than only the faulted half.

The first stage of the ICAM focused on the asset failure and the key findings were:

- The equipment was maintained in accordance with Schneider Electric's best-practice maintenance regime.
- The switchboard was housed in a controlled, suitable indoor environment.
- No abnormal network conditions contributed to the failure.
- Independent third-party analysis of the relay data verified that the upstream protection operated correctly and within required time limits.
- SF_6 gas pressure and purity across remaining panels were within acceptable parameters, eliminating gas degradation or loss as contributing factors.
- Physical inspection of the failed circuit breaker chamber showed vacuum bottles largely intact and no loose connections; however, severe arcing damage made the exact initiating cause <u>inconclusive</u>.
- The Manufacturer's (SE) investigation of the circuit breaker failure found no definitive root cause but confirmed that maintenance, environmental conditions, network conditions, and upstream protection response were all compliant and did not lead to the asset failure.

Stage 2 of the ICAM focuses on the escalation to a full bus outage.

Key findings

- Top Energy's Network Protection Design Standard ST-A6.3.1-001 (introduced 2010, externally reviewed 2016) requires that an arc flash in the switchgear or busbar chamber of a faulted circuit breaker trips only the connected bus, with the Bus Coupler isolating the healthy bus.
- Under this standard, the 6 November event should have tripped H01–H08 (Bus A & Bus Coupler) only, leaving H09–H15 (Bus B) in service, affecting only +- 2,000 customers for +- 2 hours.
- Top Energy would still have had to isolate the entire bus during the fault response and restoration for precautionary safety checks; albeit for a shorter period (additional +-21,000 customers for +- 1 hour).
- The as-built investigation found the arc flash (ILIS) protection trips for Bus A and Bus B were wired together in the Bus Coupler (H08), contrary to the design standard.
- This wiring connection caused a fault on one bus to trip both buses simultaneously.
- The DIS interlock releases for Bus A and Bus B were also found cross-wired. This was unrelated to the trip but hampered restoration switching on the night.
- Drawings from Schneider Electric and Top Energy are inconsistent, with versions showing both configurations. The Omexom PNOR Maungatapere Test Report (ELXM053, 3 December 2025) records that the T3 drawings *"contain a large amount of errors."*
- The switchboard was built and wired in line with the manufacturer's standard configuration (Bus A and B wired together).
- It could not be ascertained which standard the switchboard commissioned and tested against at the time of the original project, as the relevant records cannot be located. Records have been requested from the contractor to verify.
- Bus A wiring at Kaikohe has been corrected and tested. Bus B correction is outstanding and cannot be tested while in service.

2013 Kaikohe project responsibility demarcation

- A Top Energy Project Manager was responsible for overseeing the entire project, with a consultant Project Manager engaged to support. There are no records of technical familiarisation/induction for the Consultant in this instance.
- Schneider Electric were responsible for completion of the circuit breaker panel setup, inter-panel wiring, busbar connection and basic commissioning.
- Northpower were responsible for final construction and commissioning, including secondary wiring, final commissioning and testing.

Gaps identified

- The commissioning process at the time of the original project was not robust enough to detect the deviation from Top Energy's protection design standard.
- Project construction and commissioning documentation was not captured and stored appropriately after project completion.
- The training and onboarding of technical consultants at the time was insufficient.

Recommended actions

- Check, confirm and correct as required the ILIS arc flash protection wiring and DIS interlock release wiring on all other installed Schneider Electric GHA & GMA switchgear
    - Ngāwha Transmission confirmation complete;
    - Remaining sites are planned in FY2027
- Complete Bus B wiring correction at Kaikohe at the next available outage, with functional testing.
- Develop and document a more robust project commissioning process to ensure all future project commissioning is performed against Top Energy design standards including;
    - Roles and responsibilities;
    - Technical verification requirements; and
    - Document retention.
- Review current technical induction and familiarisation requirement for consultants and contractors engaged on substation projects, with records retained.

<u>Stage 2 Investigation detail:</u>

<u>Co-incident Faults:</u>

Carrying on and focusing on the subsequent loss of supply to 23 000 customers for about 6.5 hours that was experienced.

At 17:20:09.232h on 6 November 2025, the Relay evaluated the A-phase and B-phase currents as being above the preset settings for an overcurrent fault, and timing started for the issuing of a TRIP.

Shortly after the Currents raised, the ILIS Arc-Flash Bus signalling 'lit up' indicating into the SEL-351S7 relay

Time (NZDT)	Signal
17:20:09.232	The 'Fault' started – phase currents raised above previous load (51P1 element picked up)
17:20:09.246998	Arc-Flash Bus signal indicated into the relay (IN202)
17:20:09.266994002	'Earth Fault' element 50N1 picked up
17:20:09.331981006	'CB Closed' indication from the switchgear into the relay, drops off; 'CB Open' indication asserts
17:20:10.250	TRIP Asserted (51P1T timed out); OUT101 (Trip output from Relay) closes to trip the CB
17:20:10:54094	Fault currents extinguished (51P1 dropped off)

The above timeline indicates that the CB indicated OPEN prior to the SEL-351S relay issuing the trip – it is presumed that the CB reacted to the ILIS Trip signal and opened.

During on-site fault response on 6 November 2025, shortly after the T3 incomer circuit breaker H05 (CB163612) failure, it was observed that H05's arc flash (ILIS) protection system indicated that it detected an arc flash in both the circuit breaker and busbar chambers (Figure 1). The circuit breaker's density monitoring (IDIS) protection system indicated detection of a pressure release in the circuit breaker chamber only, pointing to a loss of SF6 insulation medium. This pressure release vented as per design through the pressure relief caps at the top rear, horizontal of the circuit breaker chamber (Figure 2). This pressure venting was of sufficient force to blast the substation equipment doors open and damaging the door latching mechanisms.

No pressure release was detected by the density monitoring (IDIS) protection system for the busbar chamber, and the pressure relief cap for the busbar chamber at the top rear, vertical remained intact (Figure 2). However, the arc flash detected by the arc flash (ILIS) protection system in the busbar chamber of T3 incomer circuit breaker H05 (CB163612) was as a result of the pressure relief caps of the circuit breaker chamber severing the busbar chamber fibre optic connected to the arc flash sensor mounted in the busbar chamber (Figure 2), which effectively failed safe by simulating a busbar chamber arc flash event.

Shortly after, Top Energy's on-site fault response isolated the affected half of the 33 kV bus (H01 to H08) and restoring the other half (H09 to H15).

The gas pressure in the busbar chamber remained healthy when verified 15/1/2026.

There is no evidence to suggest that a co-incident fault was occurring elsewhere on the Kaikohe 110 kV or 33 kV networks at the same time as the fault recorded for T3 incomer circuit breaker H05 (CB163612).

Protection Standard and Philosophy:

Given the above, the investigation turned its attention towards why an arc flash event in the circuit breaker chamber and a simulated (failed safe) arc flash event in its busbar chamber of Kaikohe 33 kV substation incomer circuit breaker (T3 incomer circuit breaker H05 (CB163612) tripped the entire 33 kV bus.

Top Energy's ST-A6.3.1-001 Network Protection Design Standard, which was introduced in 2010, and reviewed by an external consultant in 2016, specifies that Bus Zone Protection is implemented by either:

- Arc-Flash protection (offered as default with Schneider Electric switchgear, hence what is usually implemented), or
- Bus Differential Protection.
- Bus Zone Protection is to be so arranged that only the 'faulted' bus is removed from service, whereby the faulted bus is disconnected from the un-faulted bus at the Bus Coupler circuit breaker.
- An arc flash in the cable termination chamber of a 'faulted circuit breaker' only trips that circuit breaker (and inter trip to other side of transformer if it is a transformer circuit breaker).
- An arc flash in the Switchgear and/or Bus chambers of a 'faulted' circuit breaker, trip all circuit breakers on the connected bus, including the Bus Coupler circuit breaker.

According to Top Energy's ST-A6.3.1-001 Network Protection Design Standard, it was thus expected given the fault experienced, that only the circuit breakers on the faulted bus (Bus A), including the Bus Coupler circuit breaker would trip (H01 to H08).

It has to be noted that even if the arc flash (ILIS) protection operated as per design (tripped the faulted bus A only; resulting in +- 2,000 customers affected for +- 2 hours), Top Energy would still have isolated the entire bus during the fault response for precautionary safety checks; albeit for a shorter period (additional +-21,000 customers for +- 1 hour).

Construction and Commissioning Resourcing:

It is the understanding that during the Kaikohe 33 kV switch board project, Schneider Electric provided a project resource as part of the design and supply contract to lead what can be referred to as the pre-commissioning stage which involved circuit breaker panel setup, inter-panel wiring and busbar connection, up to and including basic commissioning testing.

Northpower was contracted as construction and commissioning contractor, assisting the Schneider Electric resource during the pre-commissioning stage and then going on leading what can be referred to as final construction and commissioning which involved performing secondary wiring and final commissioning and testing.

Top Energy had an externally appointed Construction Project Manager acting on behalf of Top Energy as well as an externally appointed Commissioning Representative, both involved throughout the entire project.

The investigation found that neither the externally appointed Construction Project Manager nor the externally appointed Commissioning Representative were familiarised or trained in Top Energy's standards or procedures. This was identified and rectified during a subsequent Top Energy substation construction and commissioning project, although there's no documentation to support this.

Drawings and Commissioning Processes:

During the investigation it was found challenging to locate all relevant Kaikohe 33 kV substation project construction and commissioning related documentation. Due to this, it could not be ascertained which commissioning tests, if any, were conducted on the arc flash (ILIS) protection system. Top Energy has since requested project as-built and commissioning documentation from Northpower, yet to be received.

From the Schneider Electric manufacturing drawings as well as the Top Energy drawings that are available, and which Top Energy provided post event to Omexom who was contracted to affect the repair and replacement of the failed Kaikohe 33 kV T3 incomer circuit breaker H05 (CB163612) a few observations were made, namely:

- Schneider Electric drawing G 034 798 006 1/1 ILIS – Scheme (Figure 3) depicts an arc protection bus zone protection arrangement which aligns to the protection philosophy described in Top Energy's ST-A6.3.1-001 Network Protection Design Standard.
- Omexom mark-up dated 4/12/25, Schneider Electric drawing R.034798.01.600-3.GHA 11/12 Circuit Diagram AC/DC Ring Circuits Panel H01 – H16 (Figure 4) shows a connection between the arc flash protection system trips for Bus A and Bus B in the Bus Coupler (H08). This is in contradiction to the protection philosophy described in Top Energy's ST-A6.3.1-001 Network Protection Design Standard.

- Omexom mark-up dated 4/12/25, Top Energy (Northpower as construction and commissioning contractor) drawing 02016-3300-1 Rev A (Figure 5) shows a connection between the arc flash protection system trips for Bus A and Bus B in the Bus Coupler (H08). This is in contradiction to the protection philosophy described in Top Energy's ST-A6.3.1-001 Network Protection Design Standard.

Further, when looking at the Conclusions/Recommendations section of Omexom PNOR Maungatapere Test Report (Report No: ELXM053), dated 3 December 2025 (Figure 6) , which was made available by Omexom after the repair and replacement of the failed Kaikohe 33 kV T3 incomer circuit breaker H05 (CB163612), it is noted that "the drawings for T3, both LV and HV side contain a large amount of errors". It is also recorded that the following wiring errors were found and corrected on site:

- The arc flash (ILIS) protection system trips for Kaikohe 33 kV Bus A and B were found connected together. This was corrected and tested for Bus A. The B bus functionality could not be tested due to it being in commission.
- The DIS interlock release for Bus A was found connected to the DIS interlock release for Bus B due to a secondary wiring terminal block not originally installed. Although this wiring error is unrelated to the event, it prevented effective restoration switching. A secondary wiring terminal block was sourced, installed and the wiring error corrected.

For clarification, it is not recognised industry practice at all to preventatively check, test or confirm while in operation for potential wiring errors that could have been made during construction and commissioning stages, due to the complexity thereof. It is however recognised industry best practice to check and test for wiring errors during construction and commissioning stages. This explains why these wiring errors went undetected since commissioning in 2013 until the date and time of the event.

Conclusion:

From the above, it could be concluded that Schneider Electric drawing G 034 798 006 1/1 ILIS – Scheme (Figure 3) aligns with the protection philosophy described in Top Energy's ST-A6.3.1-001 Network Protection Design Standard. However other available drawings and test reports point to the fact that the Kaikohe 33 kV switch board was built, installed and commissioned as per design with a connection in the Bus Coupler (H08) between the arc flash (ILIS) protection system trips of Bus A and Bus B. This explains why an arc flash event in the circuit breaker chamber and a simulated (failed safe) arc flash event in its busbar chamber of Kaikohe 33 kV substation incomer circuit breaker (T3 incomer circuit breaker H05 (CB163612) tripped the entire 33 kV bus.

Conflicting Schneider Electric drawings available in the drawing pack, and a not very robust commissioning process resulted in this wiring change in the arc flash (ILIS) protection system which was not in line with the protection philosophy that Top Energy currently apply. As a result, 23 000 customers lost supply for about 6.5 hours.

Details of Injury/Damage/Impact: (Nature and extent of injuries/damage/impact)					
Subsequent loss of supply to 23000 ICPs due to Kaikohe 33 kV switch board fault 6 Nov 2025.					
Immediate Actions Taken by Line Management following Incident:					
Fault response dispatched. Response proactively ventilated a smoke-like vapour from sub before entering. Protection indications pointed to an arc flash and pressure release for the bus chamber and switchgear chamber of the affected circuit breaker. As a result, fault response isolated affected half of the 33 kV bus, restoring the other half.					
Employee, Contractor and/or Third Party Incident? Employee and contractor			All Top Energy Staff		
Work category of person injured or involved Specialist/Engineer/Scientist			Click here to enter text.		
Is the activity Controlled, Monitored or Uncontrolled?	Monitored	*Was a risk assessment conducted for this task? Yes/No*	Yes	*Does a site standard or procedure exist to control this risk? Yes/No*	No
ACTUAL – Incident type and consequence Assets/Operations S6-L1 & Reputation S5-L1			*POTENTIAL – Incident type and consequence* Assets/Operations S6-L1 & Reputation S6-L1		
View the Top Energy Group Risk Matrix when selecting the severity rating ([SS05-04-S3005S - Risk Matrix])					
☐H ☒S ☐E	*Select severity rating* Level 5		☐H ☒S ☐E	*Select severity rating* Level 6	
Was this a repeat incident?	No	*Was this incident a Process Failure?*	No	*Property damage Amount*	$1.5m
Investigation Team *Leader: Jacques Brown* *Members: Andy Rogerson, Russell Fernandes, John Williams, Tony Smallman*			*Is the incident a result of an unidentified risk?* ☒ No ☐ Yes. Review and add to risk register		
Investigation Methodology *(Please indicate all methods deployed to collect the data including:* • *interviews (please mention the names of the individuals interviewed;*			*Interviews: OEM SME, Commissioning Engineer, Construction Project Manager* *ADMS logs* *RTU logs*		

• *site visits,* • *document review; and,* • *any other means*	*Document Review*
Matters that were investigated (and the limits of the investigation, including what was outside the scope of the investigation) – copy relevant section from SS08-09-001S - ICAM Terms of Reference in opposite window	*Attempt to identify why the catastrophic internal failure of T3 incomer circuit breaker (H05, CB163612) caused the subsequent loss of 23 000 customers since this was not as per the applied protection philosophy.*
Status of Investigation?	*Date investigation completed*
Preliminary	Friday, 6 March 2026

Absent or Failed Defences	*Absent or Failed*	*Details*
DF05: Awareness - work instruction / procedures	Some Failure	Project construction and commissioning related documentation are not captured and stored appropriately after project completion.
DF05: Awareness - work instruction / procedures	Some Failure	Project commissioning process at time of commissioning appears ambiguous.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	
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Choose an item.	Choose an item.	Click here to enter text.
Individual/Team Actions	*Absent or Inadequate*	*Details*
IT07: Change Management Error	Inadequate	Due to a number of external parties being involved the project construction and commissioning related documentation were not captured and stored appropriately after project completion.
Choose an item.	Choose an item.	Click here to enter text.
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Choose an item.	Choose an item.	Click here to enter text.
Task/Environmental Conditions (Workplace)	*Level of impact*	*Details*
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Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Task/Environmental Conditions (Human)	*Level of impact*	*Details*
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Choose an item.	Choose an item.	Click here to enter text.
Organisational Factors	*Contributing*	*Details*
Choose an item.	☐	
	☐	
	☐	Click here to enter text.
Choose an item.	☐	Click here to enter text.

Permanent Corrective Actions to be Taken: (Actions should relate back to ICAM investigation findings)			
Action	Hierarchy of Control Type	Responsible Person/Job Title	Due Date
Check, confirm and potentially correct arc flash (ILIS) protection system and DIS interlock release wiring for all other installed Schneider Electric GHA & GMA switchgear for Top Energy (Ngāwha Transmission - Completed).	Level 1: Eliminate the Hazard	Andy Rogerson	Click here to enter a date.
Develop & document more robust commissioning processes based on industry best practice.	Level 1: Eliminate the Hazard	Nishan Sooknandan	
When utilising external consultants and contractors, ensure they are trained to and familiarised with Top Energy standards.	Level 1: Eliminate the Hazard	Nishan Sooknandan	
Complete assurance testing for more robust commissioning processes on all high-risk projects since 2013.	Level 1: Eliminate the Hazard	Nishan Sooknandan	
Key Learnings: (Summary of learnings from incident)			

Established			
Responsible Line Manager:	Click here to enter text.	*Title:*	Click here to enter text.
Telephone:	Click here to enter text.	*Email:*	Click here to enter text.

Fig 1: ILIS protection indication for T3 incomer breaker H05 (CB163612)

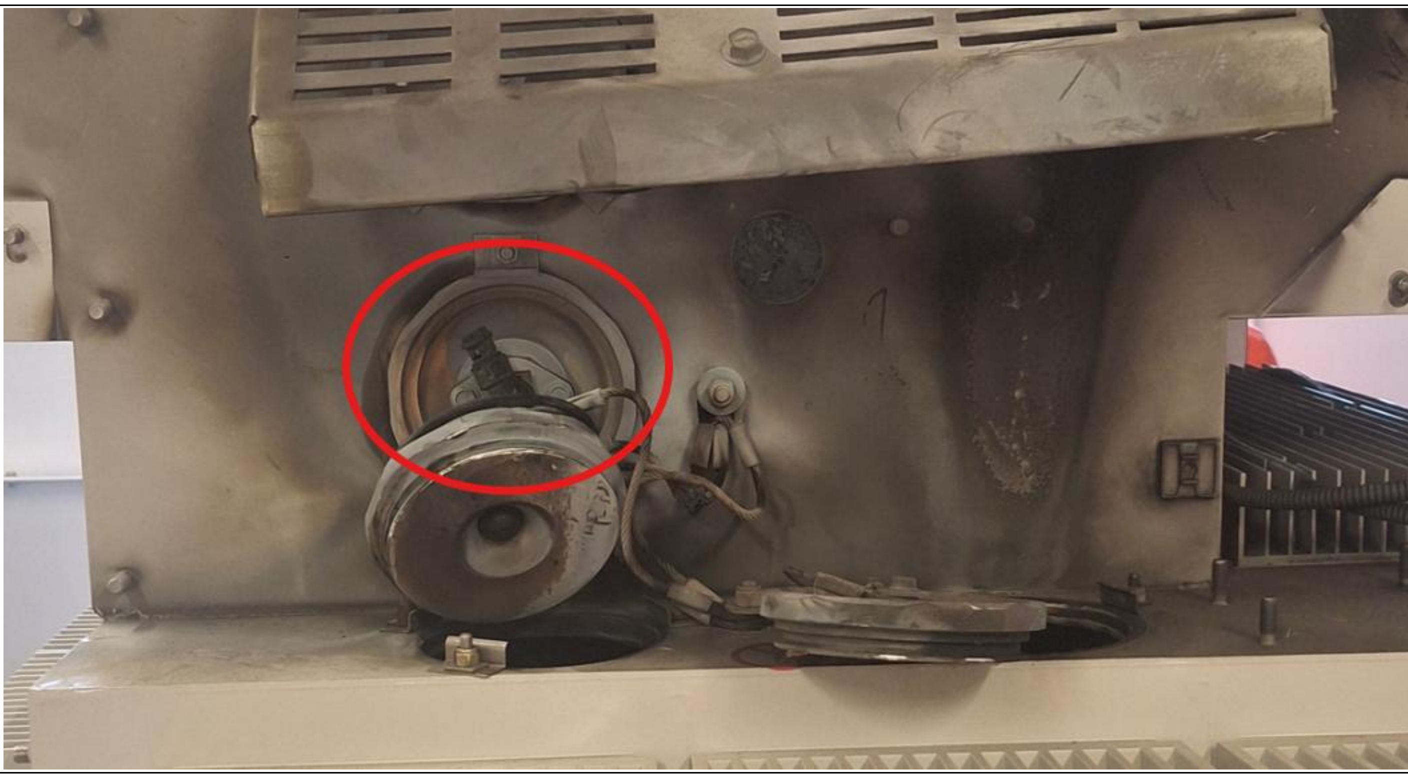


Fig 2: T3 incomer breaker H05 (CB163612 busbar chamber pressure flap intact but ILIS busbar chamber arc sensor damaged)

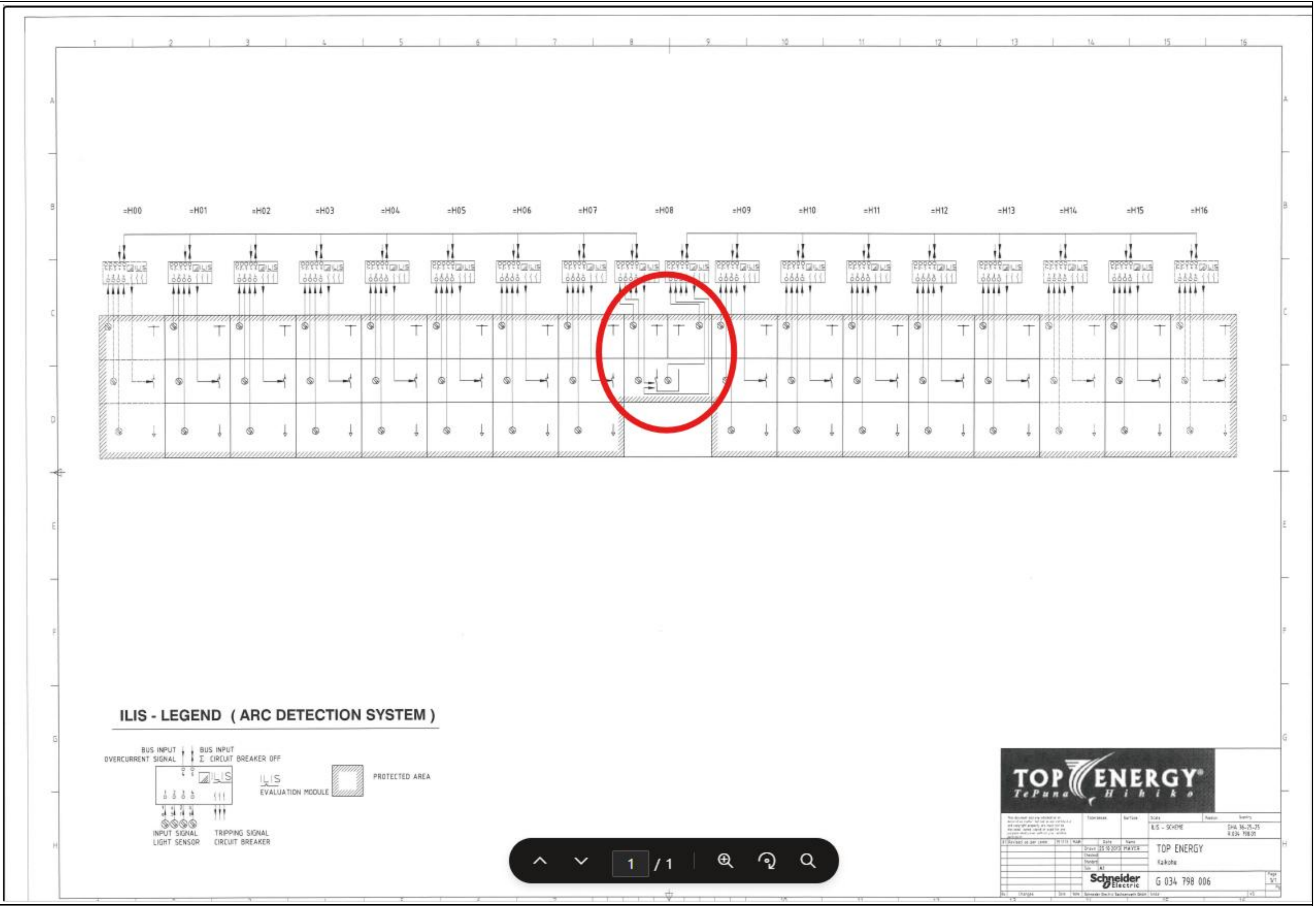


Fig 3: Kaikohe 33 kV Schneider Electric G 034 798 006 1/1 ILIS - Scheme drawing showing that the arc protection for the bus zone is split.

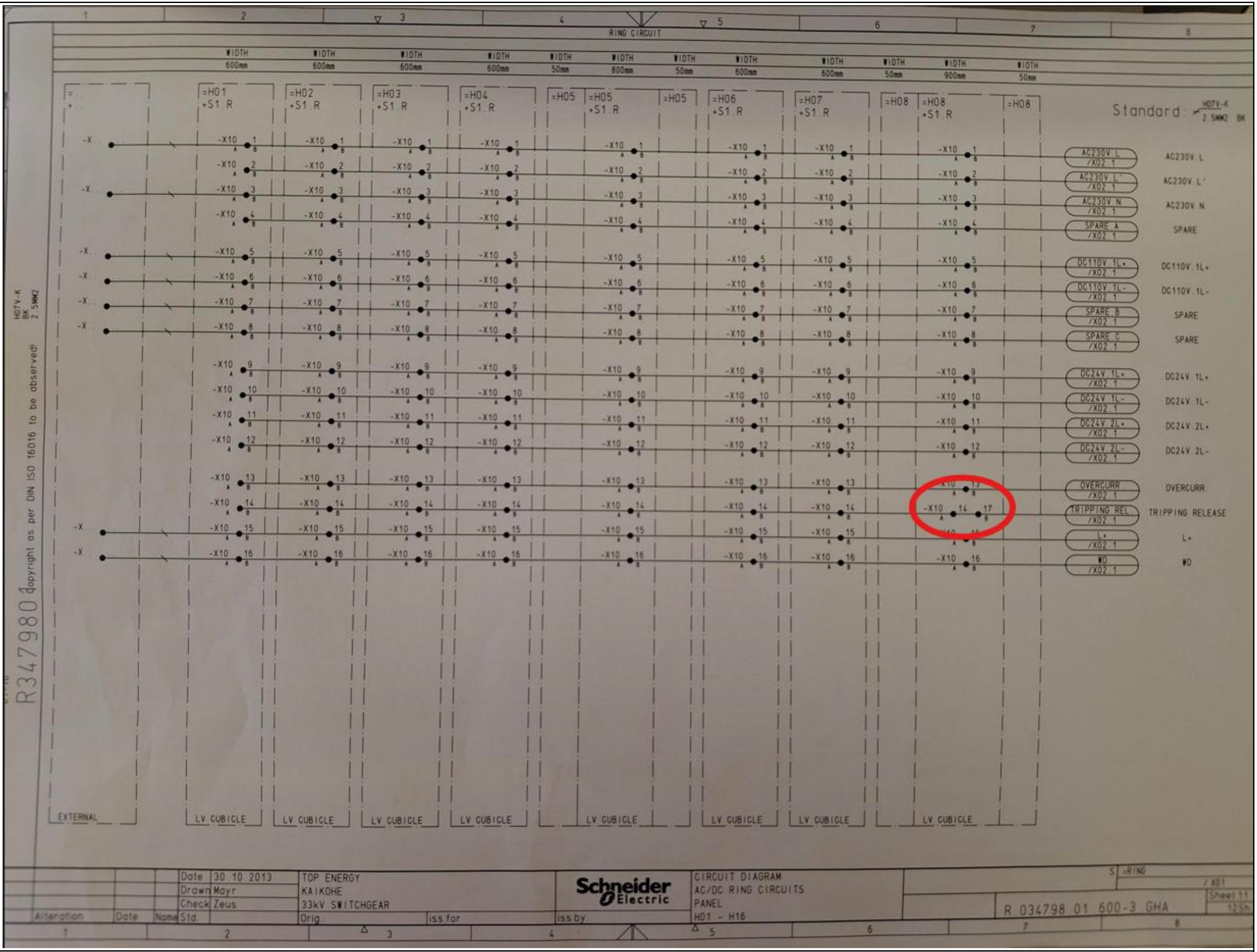


Fig 4: Schneider Electric Dwg R034798.01.600-3 GHA Sheet 11 showing a connection between the A and B bus

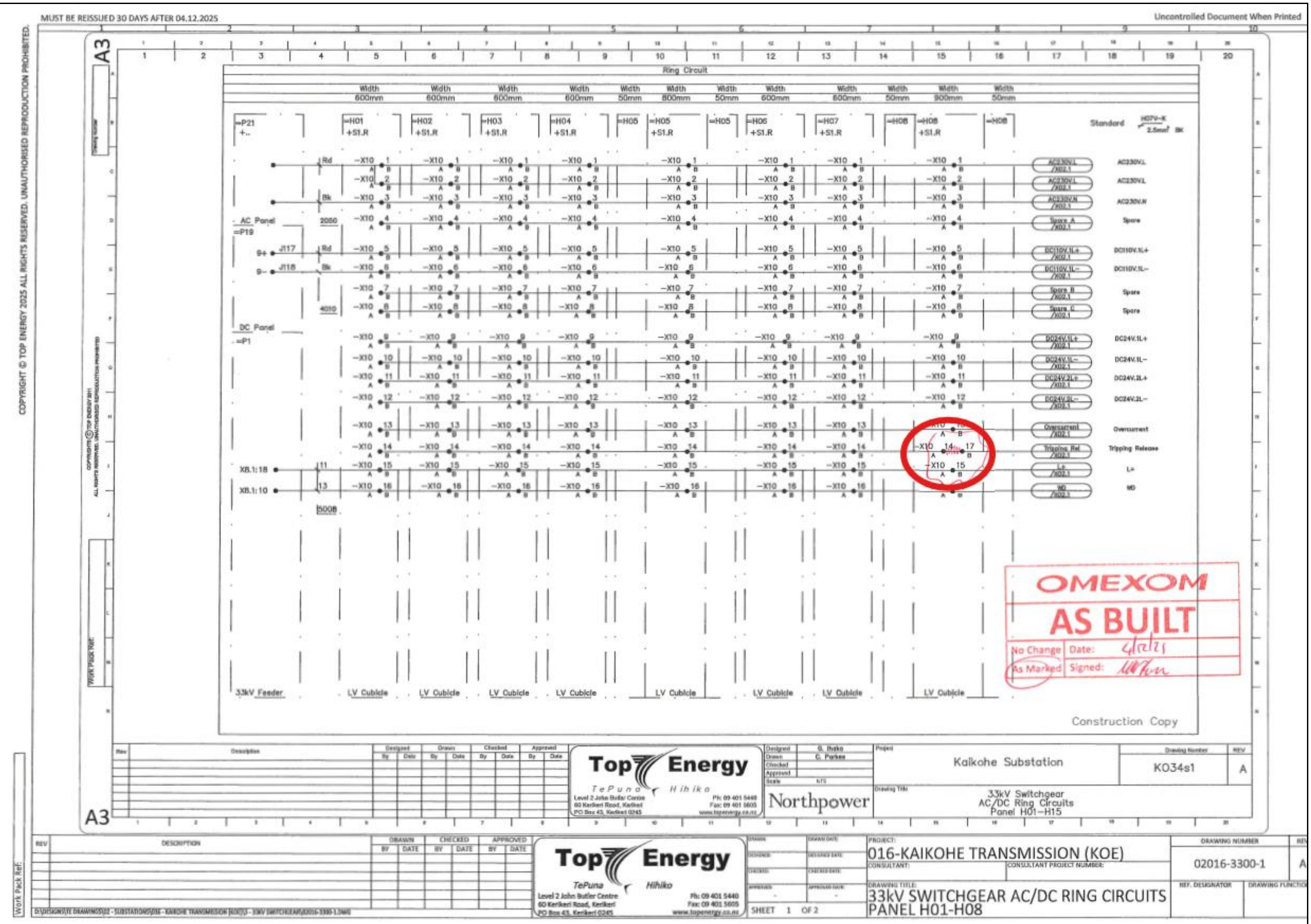


Fig 5: Top Energy Dwg 02016-3300-1 A showing a connection between the A and B bus

Pride. Performance. Value.

1 BACKGROUND

At Top Energy's KOE sub CB163612 failed. The complete CB compartment required replacement

2 SCOPE OF WORK

KOE VT_163612 Tests
KOE CT_163612 Tests
KOE CB_163612 Tests
KOE 33 kV Board A Bus tests
KOE T3 TX LV CT protection tests
KOE T3 Transformer differential checks
Arc Detection Tests
Interlocking Tests
Commissioning Tests

3 CONCLUSIONS/RECOMMENDATIONS

All test completed on H05, with good results. It should be noted that the drawings for T3, both LV and HV side contain a large amount of errors.

The following was found and corrected on site.
The Arc Flash trips for Bus A and B were found connected together. This was fixed and tested for the A board.
The DIS interlock release for Board B, was connected to Boards A DIS release. This was fixed.

Fig 6: Omexom PNOR Maungatapere Test Report (Report No: ELXM053), dated 3 December 2025

Appendix 3

11 March 2026

Top Energy
Limited
PO Box 43
Kerikeri 025
New Zealand

Attn: Claire Picking
General Manager Network

Investigation into the Kaikohe Zone Substation CB Failure November 2025

Dear Claire,

Schneider Electric has completed a comprehensive investigation into the circuit breaker failure that occurred on **6 November 2025** at the **Kaikohe Zone Substation**.

The investigation focused on maintenance history, environmental conditions, network behaviour at the time of the event, relay performance, and post-event equipment inspection.

Key findings confirm that:

- The equipment was maintained in accordance with Schneider Electric's best-practice maintenance regime.
- The switchboard was housed in a controlled, suitable indoor environment.
- No abnormal network conditions contributed to the failure.
- Independent third-party analysis of the relay data verified that the upstream protection operated correctly and within required time limits.
- SF_6 gas pressure and purity across remaining panels were within acceptable parameters, eliminating gas degradation or loss as contributing factors.
- Physical inspection of the failed circuit breaker chamber showed vacuum bottles largely intact and no loose connections; however, severe arcing damage made the exact initiating cause **inconclusive**.

Overall, despite extensive testing and forensic review, the investigation was unable to determine a definitive root cause for the failure.

We wish to extend our sincere appreciation to you and your team for your collaboration throughout the data analysis process, and for taking the time to travel to our workshop to participate in the physical inspection.

I am available to meet with you to discuss our findings. Please don't hesitate to contact me if you have any questions.

Yours sincerely

Steve Hodder
GM – Power Systems
SCHNEIDER ELECTRIC (NZ) LIMITED

Schneider Electric (NZ) Limited
Level 2, Building 6,
66 Highbrook Drive,
East Tamaki, Manukau

Appendix 4

Executive Summary

Schneider Electric has completed a comprehensive investigation into the circuit breaker failure that occurred on **6 November 2025** at the **Kaikohe Zone Substation**. The investigation focused on maintenance history, environmental conditions, network behaviour at the time of the event, relay performance, and post-event equipment inspection.

Key findings confirm that:

- The equipment was maintained in accordance with Schneider Electric's best-practice maintenance regime.
- The switchboard was housed in a controlled, suitable indoor environment.
- No abnormal network conditions contributed to the failure.
- Independent third-party analysis of relay data verified that upstream protection operated correctly and within required time limits.
- SF_6 gas pressure and purity across remaining panels were within acceptable parameters, eliminating gas degradation or loss as contributing factors.
- Physical inspection of the failed circuit breaker chamber showed vacuum bottles largely intact and no loose connections; however, severe arcing damage made the exact initiating cause **inconclusive**.

Overall, despite extensive testing and forensic review, the investigation was unable to determine a definitive root cause for the failure.

Formal Investigation Report

Circuit Breaker Failure – Kaikohe Zone Substation
Date of Event: 6 November 2025
Investigation Conducted by: Schneider Electric

---

1. Introduction

This report outlines the findings of Schneider Electric's investigation into the circuit breaker failure that occurred at the Kaikohe Zone Substation on 6 November 2025. The scope of the investigation included a review of maintenance practices, environmental conditions, network behaviour, relay performance, and a detailed physical inspection of the failed circuit breaker.

2. Maintenance Review

A comprehensive review of the maintenance logs confirmed that all maintenance activities undertaken on the board were completed in accordance with Schneider Electric's **best-practice procedures** for this class of equipment. No deviations, omissions, or overdue tasks were identified that could have contributed to the failure.

---

3. Environmental Conditions

The investigation verified that the switchboard was installed within a **conditioned building**, fully suitable for the operation of this type of equipment. Environmental factors such as temperature, humidity, and contamination risk were found to be within acceptable limits and did not contribute to the incident.

---

4. Network Conditions and Relay Behaviour

An assessment of network data at the time of the failure identified **no abnormal conditions** that would suggest a contributing operational or system factor.

Schneider Electric engaged a **third-party specialist** to analyse the relay event records. This independent review confirmed that the immediate upstream circuit breaker operated correctly and **cleared the fault within the appropriate protection time limits**. Relay performance was within specification, and no maloperation was detected.

---

5. Gas System Analysis

SF_6 gas pressure and purity measurements were taken from the remaining panels of the switchboard. Test results indicated:

- **Gas pressure:** 100%
- **Average gas purity:** 97%

These values are within acceptable operational limits, confirming that neither gas loss nor gas degradation played a role in the failure.

---

6. Physical Inspection of the Failed Circuit Breaker

Following controlled dismantling of the circuit breaker chamber, Schneider Electric conducted two detailed forensic inspections along with representatives from Top Energy and their insurance company, the first on **January 11** and second on **January 20, 2026**. Key observations included:

- The vacuum bottles were **largely intact**, indicating the failure was **not caused by an attempted opening under fault conditions**.
- No evidence of loose or poor-quality connections was found.
- Extensive arcing damage was observed between phase bars and earthed metalwork.

The level of arcing damage compromised the ability to conclusively identify the initiating event. As a result, the **root cause of the failure remains inconclusive** despite extensive review.

---

7. Conclusion

The investigation concluded that:

- Maintenance practices were compliant with best-practice standards.
- Environmental and network conditions were appropriate and non-contributory.
- Protection systems performed correctly.
- Gas conditions were within normal operating limits.
- The physical damage was too extensive to determine a definitive cause.

Given these findings, Schneider Electric has classified the root cause as **inconclusive**.

---

8. Collaboration

We wish to extend our sincere appreciation to the Top Energy team for their collaboration throughout the data analysis process, and for taking the time to travel to the Auckland workshop on two occasions to participate in the physical inspection.

Appendix 5

Independent investigation

TOP Energy asset management practices

TOP Energy Limited

25317 | 25317-RPT-001

Rev B | 5 JUN 26

Document History & Status

Revision	Date	Author	Reviewed by	Approved by	Status
A	3 June 2026	Willem Rawlins	A Williams	A Williams	Draft
B	5 June 2026	Willem Rawlins	A Williams	A Williams	Final

Revision	Details
A	Draft report for internal Ergo review
B	Final report issued to client

Table of Contents

1. Executive Summary 3
2. Introduction 4
3. Asset lifecycle practices 4
3.1 Asset Management Policy 4
3.2 Asset Management Strategy 5
3.3 Asset Management Plan 5
4. Inspection, test and maintenance records 5
5. Manufacturer's recommendations 6
6. Internal ICAM investigations 7
6.1 ICAM #1 7
6.1.1 Installation/commissioning 8
6.1.2 Maintenance 8
6.1.3 Operating 8
6.2 ICAM #2 9
7. Summary & recommendations 9
Appendix 1 SAP Maintenance schedule for CB1636712 12
Appendix 2 CB163612 maintenance records 14
Appendix 2.01 FY20 record 14
Appendix 2.02 FY24 record 15

1. Executive Summary

On 6 November 2025 at approximately 17h20 a 33 kV Schneider GHA circuit breaker at Top Energy's (TE) Kaikohe substation failed catastrophically. This resulted in the equipment doors being blasted open by the pressure release from the failure and damage the door latching mechanisms.

TE requested Ergo Consulting Limited (Ergo) to conduct an independent investigation into the asset management practices and lifecycle management of the Schneider GHA switchboard at TE's Kaikohe substation specifically. In addition, Ergo was also requested to comment on TE's internal ICAM investigations of this asset failure event.

Having reviewed TE's asset management system with respect to documentation from a policy level down to a planning level, Ergo concludes that TE has the required asset management system in place that should ensure their switchgear assets are operated and maintained in accordance with good industry standards. There is no evidence in the documentation reviewed that the failure of circuit breaker CB163612 at the Kaikohe Zone Substation on 6 November 2025 was in any way due to the lack of, or inadequate asset lifecycle management practices.

Aspects of TE's asset lifecycle management practices reviewed include:

- Asset management policy documentation
- Asset management strategy documentation
- Maintenance scheduling and inspection records
- Alignment with manufacturer's recommendations

The ICAM investigation into the magnitude of the outage as a result of the circuit breaker failure did highlight some learnings following the review of the installation and commissioning process of the switchboard in 2014 but none of these relates in any way to cause of the asset failure.

2. Introduction

On 6 November 2025 at approximately 17h20 more than 23,000 consumers on Top Energy Limited's (TE) network experienced a loss of electricity supply. The outage was the result of an arc flash event at the Kaikohe substation inside one of the 33 kV Schneider GHA circuit breaker panels. The T3 incomer circuit breaker (H05, CB163612) failed catastrophically. This resulted in the equipment doors being blasted open by the pressure release from the failure and damage the door latching mechanisms. The event caused the entire 33 kV bus to trip.

TE requested Ergo Consulting Limited (Ergo) to conduct an independent investigation into the asset management practices and lifecycle management of the Schneider GHA switchboard (the switchgear) at TE's Kaikohe substation specifically. Ergo was requested to provide this report on its findings and recommendations if any.

The report is structured as follows:

- Section 3 – Reviews the asset lifecycle and asset fleet strategies for the switchgear
- Section 4 – Reviews the inspection, maintenance, and test procedures/information/records for the switchgear
- Section 5 – Reviews the supplier's (Schneider NZ) recommended maintenance regime for the switchgear
- Section 6 -Comments on TE's internal ICAM investigations
- Section 7 - Summarises Ergo's findings

3. Asset lifecycle practices

The scope of this section confirms the existence and content of TE's asset management policy, strategy, and TE's plans to review alignment and confirm clear directives as well as accountabilities and responsibilities for asset management activities.

3.1 Asset Management Policy

TE does have a *Network Asset Management Policy* that aims to adopt "best practice" asset management principles in supporting the companies' strategic objectives. Of specific application to this investigation are the objectives to ensure:

- "Practices are underscored by effective health and safety risk management to minimise the risk of injuries to customers, staff, contractors, and the public", and
- "To achieve network quality standards that are acceptable to our consumers", and
- "To minimise the electricity cost to consumers"

The policy statement addresses safety, security, and reliability specifically which applies to this investigation. Policy implementation is clearly defined through a 'customised' RACI matrix that spans the Board of Directors and the Executive Management levels of the organisation.

3.2 Asset Management Strategy

TE does not have a stand-alone document titled Strategic Asset Management which would typically detail how corporate objectives are translated into asset management objectives and the most important actions to be taken for the organisation to ensure that it achieves its asset management objectives. This however is not a concern for the following reasons:

1. The information disclosure requirements of the Commerce Commission with respect to Asset Management Plans (AMP) includes information that would typically be included in this policy and strategy documentation. For this reason, the lack of a specific asset management strategy document is not a concern.
2. TE's latest AMP (2026 issue) clearly shows how corporate objectives align and drive specific asset management objectives.

3.3 Asset Management Plan

Asset lifecycle management is detailed in TE's AMP (section 6 of the 2026 issue) where failure modes drive the preventative and reactive maintenance activities. Although TE does not have a standalone asset maintenance strategy document, TE confirmed that there are clear directives with respect to maintenance intervals for the 33kV SF_6 type switchgear which occurs in concurrence with the four yearly protection testing regime as stated in the 2026 AMP.[1]

TE's AMP also notes that all switchgear is inspected on a monthly basis as part of the zone substation inspection regime. Although the specific 33 kV indoor SF6/vacuum circuit breaker sub-section in the AMP does not specifically address the maintenance interval for this type of switchgear, it is covered by the general statement for the overall circuit breaker asset fleet.

4. Inspection, test and maintenance records

In this part of Ergo's investigation, the commissioning test result for the switchgear was reviewed as well as the inspection and maintenance schedules that are set in TE's asset maintenance system (SAP) for the specific substation and switchgear in question.

Appendix 1 shows the maintenance schedule record for the specific circuit breaker in question (CB163612). It is evident that the maintenance cycle is set at three year intervals which is one year shorter than the manufacturer's recommendations.[2] Since the switchgear was installed and commissioned in 2014, there would have to have been three maintenance cycles prior to the event of 6 November 2025 namely FY18, FY21, and FY24.

TE acknowledges that the first maintenance cycle was missed due to the fact that "At the time of setting maintenance plans and budgets for FY18, the as-builds for the Kaikohe 33 kV substation were not yet finalised, hence by the time the maintenance plan was set up on 23 March 2018 the opportunity

[1] See comments in section 4 on maintenance schedules.

[2] See section 5.

for executing it in the FY18 maintenance cycle was missed." Maintenance records for FY21 and FY24 are shown in part[3] in Appendix 2. These records returned no actionable corrective actions for CB163612.

Because TE considers the Kaikohe zone substation as a critical site, the maintenance schedule was set-up on a three year basis as opposed to the normal four year cycle for circuit breakers. This is evidenced in the maintenance schedule depicted in Appendix 1. In addition, TE also performed timing tests on the circuit breaker CB163612 as evidenced in test reports. Ergo note that these test reports do not have a named test technician or signature displayed that would ensure test records are complete and up to date as required in prudent asset management practices.

5. Manufacturer's recommendations

The Schneider GHA series medium voltage switchgear is well known in the New Zealand electricity industry and many Electricity Distribution Businesses (EDB) and Transpower have many of these units in operation. The manufacturer's recommendation for maintenance and inspection of this type of switchgear is detailed in Table 17 of their *Installation, Operation, and Maintenance Instructions Bulletin* and copied below for reference.

Table 17 – Maintenance Interval Schedule

Maintenance Interval	Work to be Performed	Qualification/Work to be Performed By:
Every four (4) years	• Visually inspect the switchgear sections. • If necessary, clean the sections and operate the mechanisms manually. Refer to "Cleaning" on page 130.	Qualified personnel according to the work to be performed
After twenty (20) years	• Lubricate the mechanisms. Refer to "Points of Lubrication" on page 131, and perform a switching test. • Check the coils and blocking coils.	
• When the maximum admissible number of breaking operations for the circuit breaker has been reached (Refer to Figure 112 on page 130), or • After 10,000 operating cycles of the circuit breaker, or • After 1000 operating cycles of the isolation switch or grounding switch		Schneider Electric Services

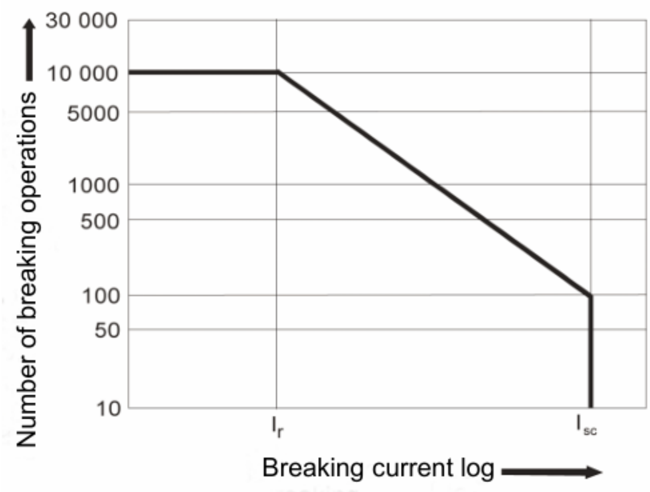
As indicated the proposed four yearly maintenance consists of inspections and external cleaning activities only. Ergo witnessed circuit breaker timing test that were conducted as part of the FY24 maintenance activities which goes beyond the manufacturers' specification. This testing is however

[3] Only the first pages are shown for evidentiary purposes.

prudent in Ergo's opinion and would provide an early indication if issues with the circuit breaker mechanism is developing.

TE records show that CB163612 has operated for a total of 68 times since commissioned in 2014 and none of the operations was for clearing fault currents. This history confirms that the circuit breaker is still well within the manufacturer's specifications for admissible summation current limit as indicated in Figure 112 of their *Installation, Operation, and Maintenance Instructions Bulletin* and copied below for reference.

Figure 112 –Admissible Numbers for Breaking Operations for the Vacuum Interrupter Chamber



6. Internal ICAM investigations

As part of the independent investigation, Ergo was also tasked to review and comment on the internal ICAM[4] investigations into the incident on 6 November 2025 conducted by TE. There were two separate ICAM investigations namely:

1. ICAM #1 which focused on TE's asset lifecycle practices for the breaker that failed, and
2. ICAM #2 which focused on the subsequent loss of 23,000 customers because of the breaker failure.

6.1 ICAM #1

This ICAM investigation specifically focused on the catastrophic, internal failure of the T3 incomer breaker CB163612. Specifically, it considers the entire asset lifecycle of the failed circuit breaker from manufacture, installation, commissioning, maintenance and operation, up to the time of the incident.

[4] ICAM (Incident Cause Analysis Method) is the acronym for a systemic process used to uncover the underlying causes of workplace accidents and near-misses.

The investigation excludes any physical intrusive inspection, testing, or analysis of the failed circuit breaker.

The ICAM report commented on installation/commissioning, maintenance & operation of the circuit breaker.

6.1.1 Installation/commissioning

Installation and commissioning were conducted under the guidance and close supervision of a Schneider Electric commissioning technician and project managed by an externally appointed construction and commissioning project manager acting on TE's behalf. The Schneider Electric commissioning technician was present from unboxing of the switchgear through to pre-commissioning tests, which included setting out, bolting down, busbar connection and inter-panel wiring. This would be standard for this type of switchgear and manufacturer but Ergo does not have any insight into the commercial arrangement between TE and Schneider Electric.

The ICAM report states that no commissioning information was available but Ergo did witness an installation and commissioning test report that covered the following:

- tightening torques,
- general assembly instructions,
- timing tests & results,
- resistance measurements,
- insulation resistance measurements,
- polarisation index measurements, and
- step voltage high pressure tests.

All results documented are reasonable and confirms that the switchboard was safe for livening. The test was completed on the 23/10/2014 and reviewed and signed off by the Commissioning Engineer on the 28/10/14.

6.1.2 Maintenance

The ICAM report findings with respect to the maintenance program and maintenance completed on the circuit breaker that failed, aligns with Ergo's findings in this report. As noted in Ergo's findings in section 4, maintenance activities exceeded that which the manufacturer recommends and TE also acknowledged that the very first maintenance in FY18 was missed.

The ICAM report also notes that there was some inconsistency between the FY21 and FY24 inspection records with respect to the checking of SF_6 pressures on all switchboard circuit breakers. However, Ergo's comments are only related to asset lifecycle processes and systems and not to comment on the effectiveness of their execution. This would be in the scope and the objective of the ICAM investigation.

6.1.3 Operating

Having reviewed the SCADA event log for the failed circuit breaker, Ergo confirms the ICAM report finding that the 68 circuit breaker operations of CB163612 was always during normal operation (i.e. load current interruption) and never for extinguishing fault current.

The statements around the “strange” clearing of a fault on 31 October 2025 that involved the circuit breaker CB163612 relates specifically to the protection scheme and protection settings per se and falls outside the scope of Ergo’s review. However, based on the findings of the ICAM investigation, Ergo would agree that it is highly unlikely that the event on 31 October 2025 could have contributed to the circuit breaker failure on 6 November 2025.

6.2 ICAM #2

This ICAM investigation specifically focussed on the reason(s) for the extent of the outage on 6 November 2025 because of the failure of CB163612. Since the 33 kV switchboard is equipped with bus zone protection, the expectation would be that only half a bus would be lost if a single circuit breaker on any half of the bus fails.

Since Ergo was not privy to the source documentation and information used by this ICAM investigation, our comments are based on the report itself, it’s thoroughness, accuracy of deductions, findings and recommendations.

The report is detailed, as one would expect, and confronts the apparent documentation, commissioning testing, and drawing as-built failures head on. It clearly identifies the importance of some aspects of construction projects in the electricity industry namely:

- Project responsibilities and accountabilities.
- Documentation management including drawing mark-ups and as-builds.
- Alignment between internal standards and commissioning testing.

In Ergo’s opinion the investigation seems thorough and the findings and recommendations are honest in pointing out the failures in specific asset management activities. As with all ICAM investigations, the true value is in the implementation of the recommendations in a timely manner and overseen at a sufficiently senior level in the organisation.

7. Summary & recommendations

The findings of this independent investigation are bulleted below.

- The *Network Asset Management Policy* lays a good foundation for a good policy but appears to be a work in progress. Ergo proposes that the policy document include a review table and a signature section for director and chief executive officer official approval.
- Maintenance schedules are set-up in TE’s SAP system in accordance with their asset management practices for critical substations which includes the circuit breaker CB163612. Ergo has verified that work orders were issued and maintenance records returned for the FY21 and FY24 maintenance periods. Although unfortunate that the first maintenance in FY18 was missed, because it entails a visual inspection only, Ergo does not regard this omission as significant due to the age and reputation of this type of circuit breaker.
- TE has performed scheduled maintenance in accordance with the manufacturer’s recommendations and in addition also conducted timing tests on the circuit breaker involved during the FY24 maintenance program. Ergo would recommend that all maintenance records

for all assets be comprehensively filled out, formally dated and signed by the responsible persons for loading and storing in TE's asset information system.

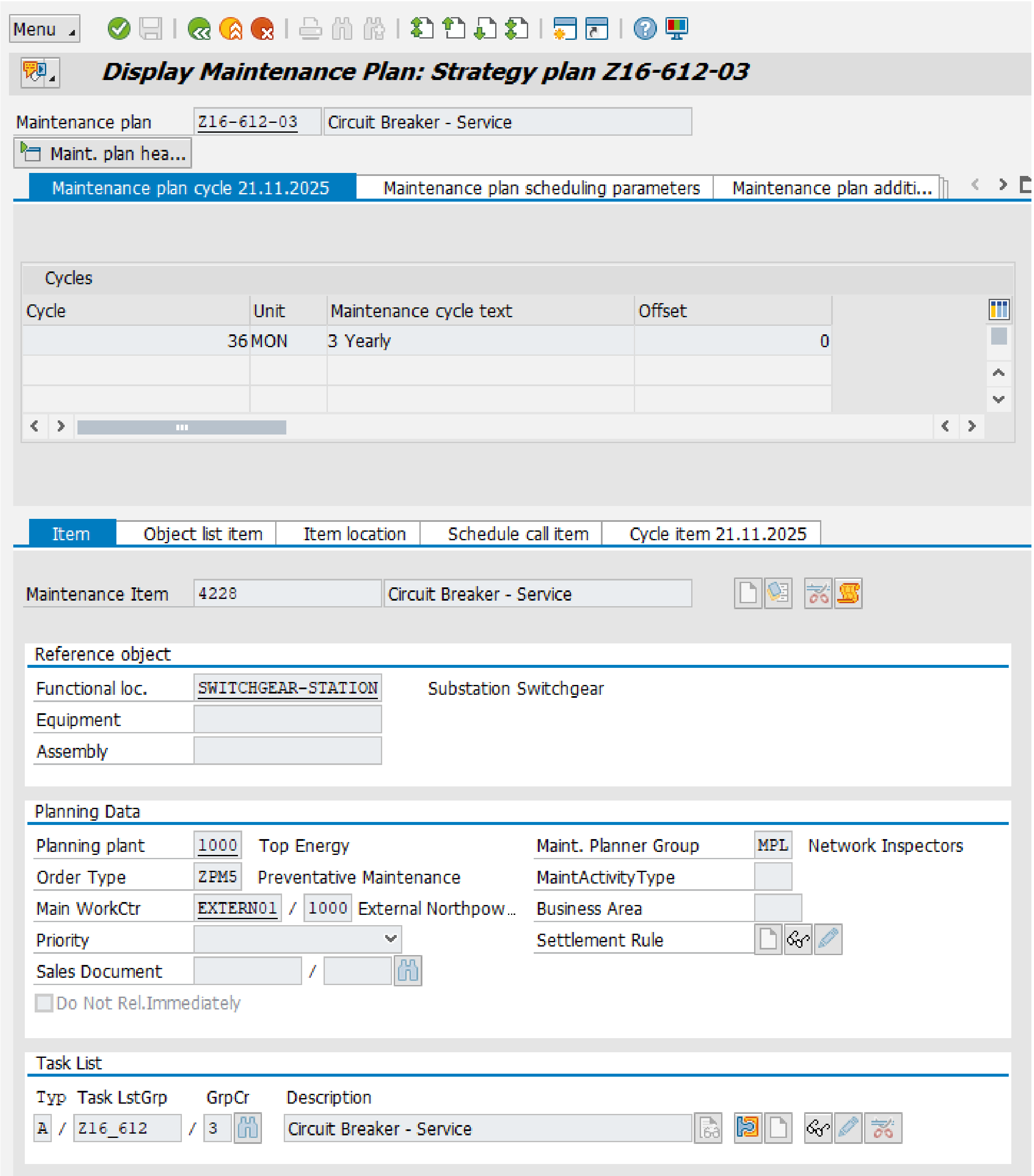
- Ergo is satisfied that TE followed the manufacturer's instructions with respect to the recommended maintenance activities and exceeded the schedule for this type of circuit breaker.
- The ICAM investigation into the asset lifecycle activities as they pertain to the failed circuit breaker, aligns with Ergo's finding in this report. Ergo agrees that there is no evidence based on all information reviewed, that the asset lifecycle management of CB163612 was in any way the root cause or a contributing factor to its failing on 6 November 2025.
- The ICAM investigation into the reason why the whole bus tripped as a result of the circuit breaker failure on 6 November 2025 as opposed to only half the bus is detailed, honest and confronts critical shortcomings during the commissioning stage of the switchboard installation.

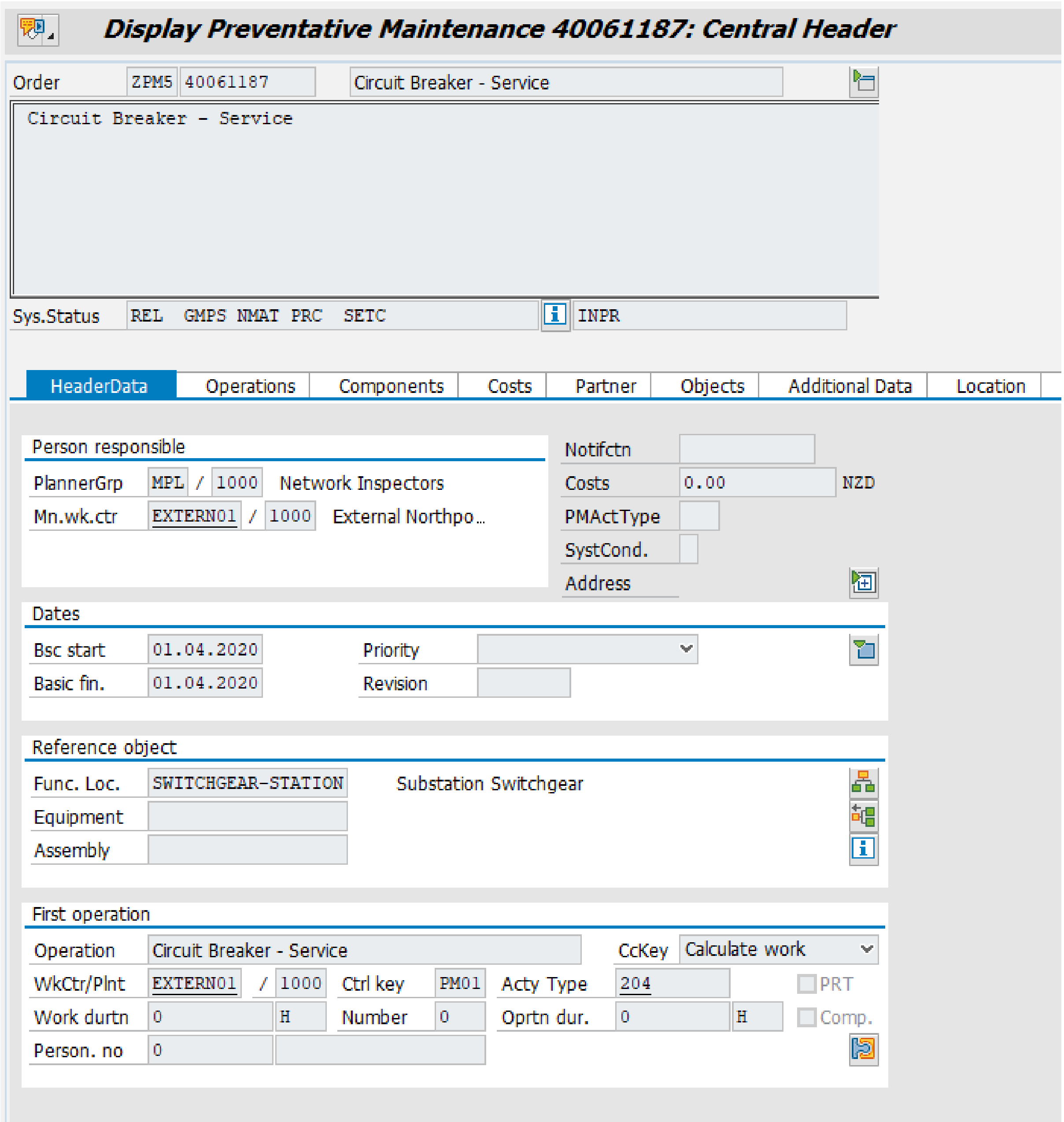
Appendices

Appendix 1 SAP Maintenance schedule for CB1636712 12

Appendix 2 CB163612 maintenance records 14

Appendix 1 SAP Maintenance schedule for CB1636712

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Order ZPM5 40061187 Circuit Breaker - Service
Circuit Breaker - Service
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INPR
HeaderData
Operations
Components
Costs
Partner
Objects
Additional Data
Location
Person responsible
PlannerGrp MPL / 1000 Network Inspectors
Mn.wk.ctr EXTERN01 / 1000 External Northpo...
Notifctn
Costs 0.00 NZD
PMActType
SystCond.
Address
Dates
Bsc start 01.04.2020
Basic fin. 01.04.2020
Priority
Revision
Reference object
Func. Loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
First operation
Operation Circuit Breaker - Service
CcKey Calculate work
WkCtr/Plnt EXTERN01 / 1000
Ctrl key PM01
Acty Type 204
PRT
Work durtn 0 H
Number 0
Oprtn dur. 0 H
Comp.
Person. no 0

Appendix 2 CB163612 maintenance records[5]

Appendix 2.01 FY20 record

Northpower

Wednesday, December 9, 2020

P12 - Circuit Breaker Maintenance

Substation
Kaikohe

Voltage
33

Job Number
TC1135682

CB Number
163612

Inspector
Mark Robson

Date of Inspection
Thursday, December 10, 2020

This form details the data capture requirements for the CB Maintenance/Service work. Typical time between service intervals is 4 yearly or as required.

The form is general and to be used for all types of circuit breakers. For the specific work instructions please refer to relevant documentation for the specific type of CB.

Test Equipment Data Capture

	Manufacturer	Model	Serial	Calibration Date
Unit 1	Camlin	P3-0701-180883	100-01779	16-09-20
Unit 2				
Unit 3				
Unit 4				

Visual and Mechanical Checks

	A	B	C	NA	Refer to Detail
Check CB Labelling	✓				

1

[5] Only the first page of each maintenance record is shown.

Appendix 2.02 FY24 record

Northpower

Monday, July 10, 2023

P12 - Circuit Breaker Maintenance

Substation
Kaikohe

Voltage
33 kV

Job Number
TC3041558

CB Number
CB163612 T3 Incomer

Inspector
Ian Reed

Date of Inspection
Tuesday, July 11, 2023

This form details the data capture requirements for the CB Maintenance/Service work. Typical time between service intervals is 4 yearly or as required.
The form is general and to be used for all types of circuit breakers. For the specific work instructions please refer to relevant documentation for the specific type of CB.

Test Equipment Data Capture

	Manufacturer	Model	Serial	Calibration Date
Unit 1	DV Power	CB Analyzer	21U380P	25/05/24
Unit 2				
Unit 3				
Unit 4				

Visual and Mechanical Checks

	No Defect	N/A	Priority	Defect	Fixed on site	Refer to Detail
Check CB Labelling	✓					
Alarms and Relay Flags Reset						

1

Appendix 6

TOP ENERGY®
Te Puna Hihiko
www.topenergy.co.nz

To	**Directors**
CC	
From	**Russell Shaw**
Date	**09 February 2026**
Subject	**Failed circuit breaker CB163612 from Kaikohe 33kV substation – Initial Findings**

Purpose
To update the board on initial findings relating to the circuit breaker outage on 6 November 2025. This paper is looking at the equipment failure only, with further investigation being undertaken to look at the scale of the outage.
This paper is for information.

Material issues
The material issues in this paper are:

- The outage exceeded the quality standard for extreme events and a report is to be submitted to the commerce commission by August 2026.
- We have engaged Ergo to review and complete an external investigation of the failure, to support our own findings. This work is due completion for the end of the financial year.
- We do not believe the fault on the 31 October provided sufficient fault current to have caused any damaged the CB, as it was within the rating of the breaker.
- The asset is "maintenance free", with the point of failure within the gas chamber and not accessible by either our staff or Schneider. It has not exceeded the manufacturers operations for additional maintenance or renewal.
- Our initial findings indicate that the failure is the result of manufacturing defect within the sealed gas chamber, at a connection point.
- We are still awaiting final report from Schneider on the cause of failure. They are currently working with SEL to review protection logs.
- Our iCAM concludes that there was no meaningful actions Top Energy could have undertaken to mitigate this failure, either through commissioning, maintenance or operational activities.

Appendix One provides more detail on the failure, photos and a summary of our iCAM investigation.

Recommendation
It is recommended that the Board accept for information.

Russell Shaw
Chief Executive
Top Energy Group

Prepared by:
Claire Picking, GM Network
Appendix One

Appendix One - Failed circuit breaker CB163612 from Kaikohe 33kV substation – Initial Findings

Failure Mode detail

The failed circuit breaker CB163612 from Kaikohe 33kV substation was sent to Schneider’s Auckland facility for failure analysis.

- Two inspections of the breaker chamber were conducted with Top Energy and its insurers present; the first included remote technical guidance from Schneider's India and Germany teams, while the second did not involve overseas representatives.
- All parties confirmed the fault originated within the circuit breaker chamber, with no impact from either the CT/cable box chamber or the gas-filled bus bar chamber above (which maintained proper pressure). The SF6-filled breaker chamber had experienced a strong pressure impulse, causing all sides to bulge outward and ejecting the rear pressure relief caps.
- Inspection revealed multiple arcing sites, especially at or above the three vacuum interrupter bottles, which are central to the breaker's function. Below these interrupters, minimal arcing damage was observed. Notably, the L1 phase showed significant burning and arcing below the moving contact drive link, unlike the cleaner L2 and L3 phases.

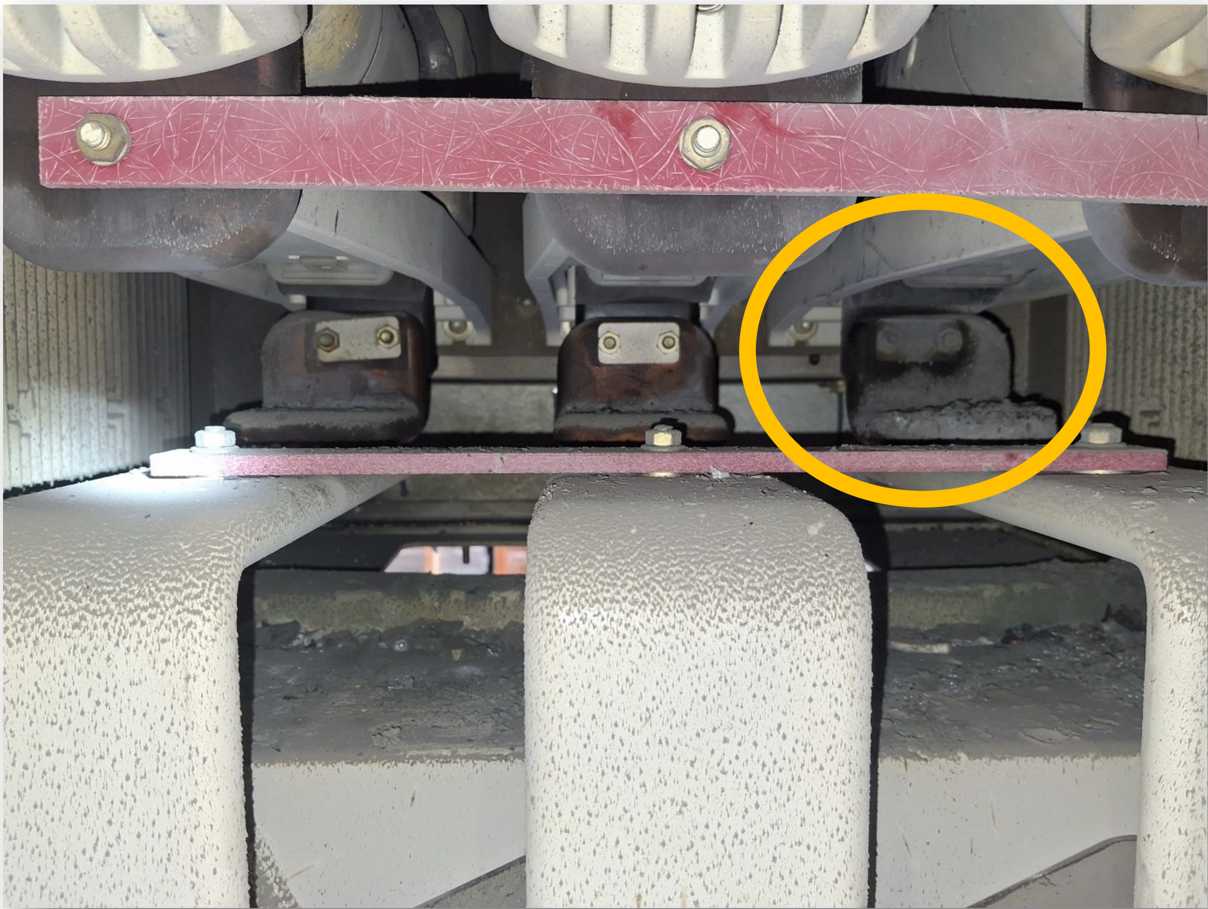

Figure 1: The vacuum interrupter assemblies are at the top of the image. Just below them are bolted connections that connect to the copper connectors that leave the chamber below the bottom of the image. The difference between the right hand L1 phase and the other two connections bolted connections is highlighted.

This difference on the L1 phase directed opening the chamber on the sides adjacent to that L1 area. A large section of the housing was cut open to access it, the side of the chamber adjacent to the equivalent L3 area was also opened up so that the phases could be compared.

Figure 2: Opening created adjacent to the L1 circuit breaker assembly. Holes in the L1 vacuum interrupter are noted in the middle of the image.

- The ceramic housing of the interrupters on both L1 and L2 phases were found to have ruptured.
- Severe arcing damage was found on the L1 circuit's current path between the interrupter and its drive mechanism, specifically at the interface of the interrupter stem and a large copper plate. Over 20 millimetres of copper eroded, creating an air gap, although the interrupter stem appeared externally intact.
- Schneider technicians were unfamiliar with the joint’s construction.
- The molten copper debris discovered beneath the L1 interrupter resulted from prolonged overheating and dripping metal.

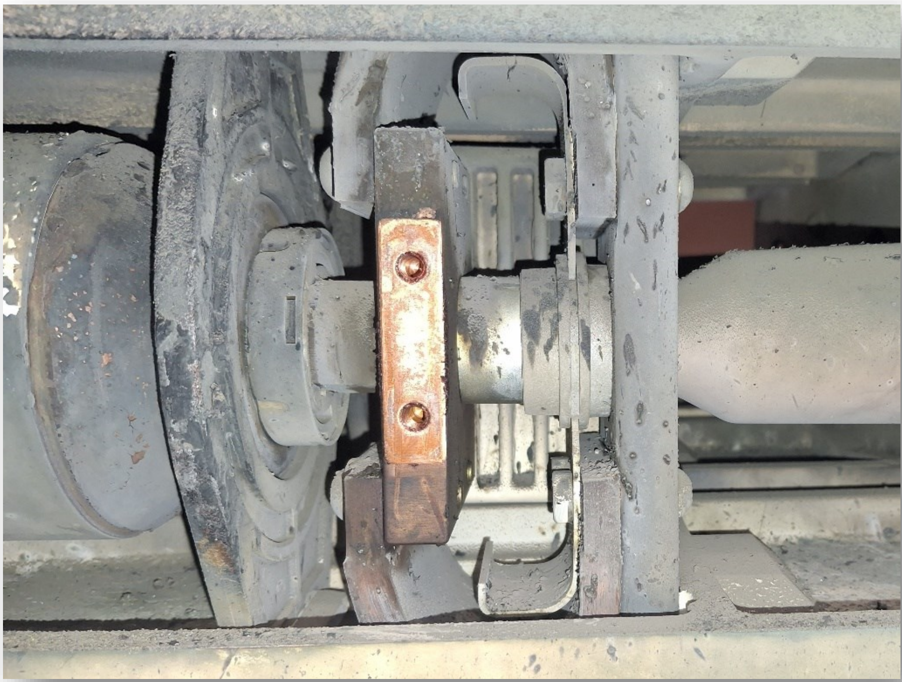

Figure 3: This pair of images shows the L3 phase moving assembly above and the L1 phase moving assembly below note the L3 phase image has been mirrored to provide an equivalent image. Note the severe damage on the L1 phase moving assembly.

Figure 4: the L1 moving assembly above shows the end of the vacuum interrupter, the stem of the moving contact that is connected to the large copper plate in good condition. The L1 part of the image below shows approximately 20 millimetres of that shaft has been eroded by arcing.

- This contact is deep within the mechanism of the circuit breaker and not user serviceable or user accessible. Further, it is not serviceable by Schneider technicians in New Zealand.
- It was assembled by Schneider in the factory and has been enclosed in an SF6 filled gas chamber so entirely non-accessible since.
- It is recognised that the failed connection is both current carrying in its function and also provides mechanical drive for the interrupter. At this point in time the construction of this connection is not understood nor is its failure mode.
- **We await Schneider's perspective on the failure and their description of how this connection may have deteriorated over the time in service of this circuit breaker chamber.**

Initial ICAM findings

Stage 1 of the iCAM report has been completed and the following points are noted:

- The failed T3 incomer breaker H05 (CB163612) is of Schneider Electric make, type GHA-36-25-25, manufactured in 2014 and commissioning in service on 30 October 2014 (thus installed in FY15).
- A t the time of conducting this ICAM investigation and report compilation, no commissioning test reports or results could be located. There is however no conclusive evidence that illustrates that the T3 incomer breaker H05 (CB163612) could have been compromised by incorrect commissioning practices.
- The Schneider Electric GHA series panels have a hermetically sealed pressure system and does not require servicing over its entire service life.
    - o Greasing of drives and checking of releases/blocking coils have a recommended service interval 'after 20 years.
    - o Replacement of a switchgear panel are only recommended once the maximum admissible number of breaking operations for the vacuum interrupters has been reached or after 2000 operations of the disconnector or earthing switch.
- Top Energy's visual maintenance activities exceed that of the manufacturer's requirement, at 3yearly, included record of the gas pressure.

- The climatic conditions (ambient temperature and humidity) inside the Kaikohe 33 kV substation building as observed during maintenance cycles also pointed to nothing that could have contributed to the failed T3 incomer breaker H05 (CB163612).
- On 6 November 2025, T3 incomer breaker H05 (CB163612) only had 68 operations registered, of which none were for breaking short circuit fault current.
- There is no evidence to suggest that a co-incident fault was occurring elsewhere on the Kaikohe 110 kV or 33 kV networks at the same time as the fault recorded for T3 incomer breaker H05 (CB163612).
- A Phase-to-Phase fault occurred on the Mount Pokaka - Worsnops 33 kV circuit on 31st October 2025, caused by a fallen tree branch, with fault currents recorded between 716-738 A and a negative-sequence component of 1240 A; the fault was cleared via Kaikohe T2 & T3 Transformer HV protection after 3 seconds.
    - This fault was not considered severe enough to cause lasting damage to the circuit breaker panel (rated at 2500A continuous & 25kA/3s) and is not believed to be connected to the event of 6 November.
- Historic CT bushing failures in Schneider Electric GHA switchgear were eliminated as the cause of this incident, due to network-wide improvements in cable clamping. No arc detection occurred in the cable compartment, confirming it was not the fault location. CTs from the failed panel were tested, found healthy, and reused in the new panel; visual inspection revealed no damage or deterioration to the CT bushings.
- Our findings relating to the cause of the CB failure is that it did not of failed or absent asset lifecycle management practices as the root cause. It is acknowledged that Top Energy is now awaiting the findings and outcome of the detailed intrusive inspection conducted by the Original Equipment Manufacturer (OEM).

This initial iCAM only covers the equipment failure. Further investigation is underway to identify the root cause of the scale of the outage.

Appendix 7

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To	**Directors**
CC	
From	**Russell Shaw**
Date	**14 May 2026**
Subject	**Failed Circuit Breaker CB163612 from Kaikohe 33kV Substation – ICAM Findings**

Purpose
To update the board on initial findings relating to the circuit breaker outage on 6 November 2025. This paper concludes our internal findings, of the asset failures, and the subsequent impact of the failure.
This paper is for information

Material issues
The key findings from the Stage 1 ICAM (Equipment Failure) are:

- The equipment was maintained in accordance with Schneider Electric's best-practice maintenance regime.
- The switchboard was housed in a controlled, suitable indoor environment.
- No abnormal network conditions contributed to the failure.
- Independent third-party analysis of the relay data verified that the upstream protection operated correctly and within required time limits.
- SF_6 gas pressure and purity across remaining panels were within acceptable parameters, eliminating gas degradation or loss as contributing factors.
- Physical inspection of the failed circuit breaker chamber showed vacuum bottles largely intact and no loose connections; however, severe arcing damage made the exact initiating cause inconclusive.

The key findings from the Stage 2 ICAM (Impact on customer) are:
Summary of event

- As a result of the asset failure 23,000 ICP were subsequently interrupted for 6.5 hours.
- Arc flash protection tripped Bus A *and* Bus B.

Demarcation of Responsibility of Project

- A Top Energy (TE) Project Manager was responsible of overseeing the entire project, with a consultant PM to support. There is no evidence of the external PM being familiarised or trained on TE standards at the time of the project.
- Schneider Electric were responsible for completion of the circuit breaker panel setup, inter-panel wiring, busbar connection and basic commissioning.
- Northpower were responsible for final construction and commissioning including secondary wiring, final commissioning and testing.

Findings

- The manufacturers standard trips A *and* B bus on fault, Top Energy standard is to trip A *or* B bus, dependant on position of the fault.
- There was no other co-incident fault on the network which would contribute to the fault.
- The switchboard was built and wired in line with the manufacturer's standard configuration (Bus A and B wired together).
- Under the TE standard, the 6 event should have tripped Bus A & Bus Coupler only, leaving Bus B in service, affecting only +- 2,000 customers for +- 2 hours.
    - Top Energy would still have had to isolate the entire bus during the fault response and restoration for precautionary safety checks; albeit for a shorter period (additional +-21,000 customers for +- 1 hour).
- The drawings held on file are inconsistent, showing both standards between drawings.
- It could not be ascertained which standard the switchboard commissioned and tested against at the time of the original project, as the relevant records cannot be located. Records have been requested from the contractor to verify.
- Bus A wiring at Kaikohe has been corrected and tested. Bus B correction is outstanding and cannot be tested while in service.
- There is no maintenance in place to recognise wiring errors post commissioning. This is in line with industry best practice.
- The wiring discrepancies remained undetected until event.

The gaps identified are:

- The commissioning process at the time of the original project was not robust enough to detect the deviation from Top Energy's protection design standard.
- Project construction and commissioning documentation was not captured and stored appropriately after project completion.
- The training and onboarding of technical consultants at the time was insufficient.

Remedial actions are:

- Check, confirm and potentially correct arc flash (ILIS) protection Check, confirm and correct as required the ILIS arc flash protection wiring and DIS interlock release wiring on all other installed Schneider Electric GHA & GMA switchgear
    - Ngāwha Transmission confirmation complete;
    - Remaining sites are planned in FY2027
- Complete Bus B wiring correction at Kaikohe at the next available outage, with functional testing.
- Develop and document a more robust project commissioning process to ensure all future project commissioning is performed against Top Energy design standards including;

    - Roles and responsibilities;
    - Technical verification requirements; and
    - Document retention.
- Review current technical induction and familiarisation requirement for consultants and contractors engaged on substation projects, with records retained.

It is expected that the external report from Ergo will be received by the end of May.

Also attached (Appendix three and four) is confirmation from Schneider of their report findings, indicating the failure was not related to the maintenance, environment, network conditions or any prior protection events.

Recommendation
It is recommended that the Board accept for information.

Russell Shaw
Chief Executive
Top Energy Ltd

Prepared by:
Claire Picking
General Manager Network

Appendix One: iCAM Stage One
Appendix Two: iCAM Stage Two
Appendix Three: Schneider Letter
Appendix Four: Schneider Final Report

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☐ Appendices XYZ were not generated by the Company, but we believe it is reasonable to rely on it.

Appendix 8

Top Energy Limited
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To	**Directors**
CC	
From	**Russell Shaw**
Date	**06 March 2026**
Subject	**Network Improvement Programme**

Purpose
To provide the Board with a business improvement plan, addressing concerns relating to network planning processes in light of FYE 2026 performance.
This paper is for information.

Material issues
The material issues in this paper are:

- This financial year (FYE2026) has been difficult with a number of high impact, high profile outages, two affecting Kaikohe Substation's southern network at the end of 2025 and four affecting the Kaitaia substation and northern network.
- **Kaikohe outages**
  1. 31 October – **Protection Maloperation -** Tree fault on the Mt Pokaka-Wiroa caused substation outage due to disabled line-diff protection.
  2. 6 November **Premature Equipment Failure** – Catastrophic circuit breaker failure. Our current understanding is manufacturer error, pending finalised report from Schneider.
- **Kaitaia outages**
  1. 13 February 2026 **- Lightning Damage** – Lightning damage of a 110 kV insulator on an ABS, also damaged protection relay, taking T1 out of service
  2. 16 February 2026**– Protection -** Overcurrent protection triggered as solar generation injection exceeded the rating of the in service transformer (42MVA)
  3. 17 February 2026 – **Protection** -– Generation constraint lifted automatically, unintentionally, when implementing ANM, causing the same overcurrent protection as the prior day.
  4. 03 March 2026 – **Protection** - Overcurrent protection operated from the diesel generator's control system, following the previous weekend's

planned outage. The diesel Generator controller triggered on overcurrent and signalled to open the T1 33 kV circuit breaker.

Background

The Top Energy Network has been designed to operate with single-direction energy flow, however, with the increase in domestic and utility scale distributed generation, the network operates with reverse power flows. This particularly affects the Kaitaia substation, where we cannot operate at N-1 security as the energy flows exceed the rating of our T1 transformer bank.

Summary of Actions

Task	Action from associated Fault	Planned Completion Date
1. Network Planning		
Review of commissioning standards for substation works	2, 6	EoFY
Network wide network configuration review - recommended actions to follow	All	May-26
Critical spares review: 110 / 33 kV	2, 3	Jul-26
Critical spares review: Distribution	2, 3	Jun-27
GHA switchgear investigation - other subs	2	EoFY
Diesel Generation connection points across the network	6	EoFY
Review Security standard, and network compliance	4	May-26
2. Processes		
OT testing and Production Process review	5	Complete
Review utility scale DG planning processes, to include network wide protection and operational impacts.	4,5	May-26
Contingency planning documentation	All	EoFY
Implement ANM for congestion management in TECC		Complete
3. Protection		
Review Network wide Line-diff enablement	1	Complete
Review alarm/notification of protection enablement	1	Complete
Network wide protection Study	1, 4, 6	Sept-26
4. Diesel Generation		
Upskill staff for generator control - at least two field staff TECS, three trained in TECC, two in engineering	6	Feb-27
Review Planned, unplanned, islanding documentation – to review, ensure resynchronisation part is comprehensive	6	Jun-26
Review getting ADMS visibility and alarms of the generation control system	6	TBC
Switching Plan review to include the re-synchronisation stages, wording, and review process for specialist equipment or systems – to include peer review through specialist knowledge	6	Apr-26

Review demarcation of responsibility between generation controller, TECC controller, On-site specialist etc	6	Apr-26

Conclusion

The events experienced during FYE2026 have highlighted the increasing complexity and operational risk arising from changing network flows, asset condition, and procedural dependencies.

The actions outlined in this paper are intended to strengthen network planning, protection, and operational discipline, while improving resilience and reducing the likelihood of repeat events.

A monthly update to this plan will be provided to the board until all items are completed.

Recommendation

It is recommended that the Board accept, for information.

Russell Shaw
Chief Executive
Top Energy Ltd

Prepared by:
Claire Picking
General Manager Network

Appendix: Network Improvement Programme

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To	**Directors**
CC	
From	**Russell Shaw**
Date	**15 04 2026**
Subject	**Network Improvement Programme**

Purpose
To provide the Board with an update of the business improvement plan, addressing concerns relating to network planning processes in light of FYE 2026 performance.
This paper is for information.

Material issues
The significant progress updates are:

- Configuration and security standards are 40% completed, on track for May 2026
- Consultant has been engaged for transmission critical spares review, commencing in the May.
- External contractor (Omexom) are currently being engaged for wiring review of substations with GHA plant.
- Network study to identify appropriate generation connection point is underway. 18 sites have been identified, and a delivery plan is underway.
- Contingency and operational co-ordination documentation for solar generators and outage co-ordination have been drafted.
- Consultant has been approached for training of additional staff on diesel generation control.
- Diesel generation alarms enabled in ADMS.
- Diesel generation documentation updated.

Recommendation

It is recommended that the Board accept, for information.

Russell Shaw
Chief Executive
Top Energy Ltd

Prepared by:
Claire Picking
General Manager Network

Appendix:
One - Network Improvement Programme Update

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APPENDIX 1 – NETWORK IMPROVEMENT PROGRAMME UPDATE

Background

This report provides an update on the network improvement programme presented in March 2026 following FY26, which suffered several large scale outages at Kaikohe and Kaitaia.

Kaikohe outages

1. 31 October – **Protection Maloperation** - Tree fault on the Mt Pokaka-Wiroa caused a substation outage due to disabled line-diff protection.

2. 6 November **Premature Equipment Failure** – Catastrophic circuit breaker failure. Our current understanding is manufacturer error; a report has been received, however, we strongly dispute its conclusion. This can be found in Appendix Two and Three.

Kaitaia outages

3. 13 February 2026 **- Lightning Damage** – Lightning damage of a 33 kV insulator on the common 33 kV bus, also damaged protection relay taking T5 out of service.

4. 16 February 2026**– Protection -** Overcurrent protection triggered as solar generation injection exceeded the rating of the in-service transformer (47 MVA). This was on supervisory control, while ANM (Adaptive network management) was not active, due to technical issues, and we were unable to constrain the network in sufficient time before overcurrent protection operated.

5. 17 February 2026 **– Protection** -– Generation constraint lifted automatically, unintentionally, when implementing ANM, causing same overcurrent protection as prior day. ANM has subsequently been livened with revised/reviewed constraints applied. One of the generators ramped up additional inverters as this work was happening. Our communications protocol has been re-issued to them, so we are aware of operational changes prior to them coming into effect. OT change management protocols have also been introduced.

6. 03 March 2026 **– Protection** – Overcurrent protection operated from the diesel generator's control system, following the previous weekends planned outage. The diesel Generator controller triggered on overcurrent, and signalled to open the T1 33 kV circuit breaker. Historically the peak load demand in the area would not have triggered this element. The reverse flow from the generation now exceeds the level at which this element would operate. The generator protection element and ability to operate the circuit breaker have been disabled. An incident review has been undertaken and specific improvements have been identified as per Table 1, section 4.

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Actions from Incident reviews

Task	Planned start date	Planned Completion Date	Status
1. Network Planning			
Review of commissioning standards for substation works	Apr-26	EoFY	Contractor currently being engaged, awaiting proposal.
Network wide network configuration review - recommended actions to follow	Mar-26	May-26	We are currently more than 40% complete with a report that details network wide configuration improvements.
Critical spares review: 110 / 33 kV	May-26	Jul-26	Contractor has been engaged, ready to start in May.
Critical spares review: Distribution	Apr-27	Jun-27	
GHA switchgear investigation - other subs	Apr-26	EoFY	In process of engaging an external contractor to investigate the ILIS and Bus inter-trip wiring.
Diesel Generation connection points across the network	Apr-26	EoFY	We are currently undertaking a study of substations and feeders and security levels at those sites to identify which substation would need generation connection points. The report has identified 18 locations that are suitable for Diesel generation points.
Review Security standard, and network compliance	Mar-26	May-26	We are currently more than 40% complete with the review of security standards and network compliance.
2. Processes			

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OT testing and Production Process review		Complete	1: NARs are to be raised for work on, or affecting, in-production OT systems, through the non-network application stream on EDNAR; 2: OT System Changes, modification and updates are not to be undertaken between 1100-1500, when network injection is ramping up/at peak.
Review utility scale DG planning processes, to include network wide protection and operational impacts.	Mar-26	May-26	Review of current process underway we are approximately 40% complete. The review is expected to result in a change of process and potentially a new workflow to incorporate protection and operational impacts.
Contingency planning documentation	Apr-26	EoFY	Several key contingency documents have been drafted for internal review: • Feeder Restoration Schedule, • Participant Rolling Outage, • Top Energy Control Centre and Lodestone Operational Coordination, • Top Energy Control Centre and Project Pukenui LP Operational Coordination, • Top Energy Control Centre and Twin River Solar Farm Operational Coordination, • 110kV contingency plan Guide for the KOE-KTA Line, • Embedded Generation Contigency Guide for the Northern Network.
Implement ANM for congestion management in TECC		Complete	
3. Protection			

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Review Network wide Line-diff enablement		Complete	Confirmed all as expected.
Review alarm/notification of protection enablement		Complete	Process update, physical d/c of comms, prompts alarm at SCADA
Network wide protection Study	Apr-26	Sept-26	Review of Kaikohe protection complete. Consultant has been engaged for transmission protection and the review has begun. This will be a staged process with monthly progression reports delivered by the consultant.
4. Diesel Generation			
Upskill staff for generator control - at least two field staff TECS, three trained in TECC, two in engineering		Feb-27	Have approached specialist for training proposal to cover: • Staff training (contracting, engineering/maintenance, and Control Centre staff), covering: • Islanding and black start of the diesel generators (NGF + KTD and Omanania) • Operation and management of the generator controllers, both on site and via remote software • Development and review of black start procedures for the Northern Network and Omanania • Testing the black start procedures for the above sites using the ADMS/NMS simulator • Review of system requirements and identification of any improvement opportunities
Review Planned, unplanned, islanding documentation – to review, ensure resynchronisation part is comprehensive	Apr-26	Jun-26	Document is under review for recommended changes and peer review to be done upon completion.
Review getting ADMS visibility and alarms of the generation control system	Apr-26	Complete	Enabled in ADMS

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Switching Plan review to include the re-synchronisation stages, wording, and review process for specialist equipment or systems – to include peer review through specialist knowledge	Mar-26	Complete	Added to the switching processes
Review demarcation of responsibility between generation controller, TECC controller, On-site specialist etc	Mar-26	Apr-26	In progress

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To	**Directors**
CC	
From	**Russell Shaw**
Date	**15 04 2026**
Subject	**Network Improvement Programme**

Purpose

To provide the Board with an update of the business improvement plan, addressing concerns relating to network planning processes in light of FYE 2026 performance.

This paper is for information.

Material issues

The significant progress updates are:

- Configuration and security standards are 60% completed, on track for May 2026
- External contractor (Omexom) are currently being engaged for wiring review of substations with GHA plant, to commence in August.
- Contingency and operational co-ordination documentation for solar generators and outage co-ordination have been drafted.
- A number of actions have been identified in our DG application processes, including End to End process mapping, early works agreements and technical standard updates.
- Several key contingency documents have been reviewed and published.

Recommendation

It is recommended that the Board accept, for information.

Russell Shaw
Chief Executive
Top Energy Ltd

Prepared by:
Claire Picking
General Manager Network

Appendix:
One - Network Improvement Programme Update

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Background

This report provides an update on the network improvement programme presented in March 2026 following FY26, which suffered several large scale outages at Kaikohe and Kaitaia.

Kaikohe outages

1. 31 October **– Protection Maloperation -** Tree fault on the Mt Pokaka-Wiroa caused a substation outage due to disabled line-diff protection.

2. 6 November **Premature Equipment Failure** – Catastrophic circuit breaker failure. Our current understanding is manufacturer error; a report has been received, however, we strongly dispute its conclusion. This can be found in Appendix Two and Three.

Kaitaia outages

3. 13 February 2026 **- Lightning Damage** – Lightning damage of a 33 kV insulator on the common 33 kV bus, also damaged protection relay taking T5 out of service.

4. 16 February 2026**– Protection -** Overcurrent protection triggered as solar generation injection exceeded the rating of the in-service transformer (47 MVA). This was on supervisory control, while ANM (Adaptive network management) was not active, due to technical issues, and we were unable to constrain the network in sufficient time before overcurrent protection operated.

5. 17 February 2026 **– Protection -**– Generation constraint lifted automatically, unintentionally, when implementing ANM, causing same overcurrent protection as prior day. ANM has subsequently been livened with revised/reviewed constraints applied. One of the generators ramped up additional inverters as this work was happening. Our communications protocol has been re-issued to them, so we are aware of operational changes prior to them coming into effect. OT change management protocols have also been introduced.

6. 03 March 2026 **– Protection** – Overcurrent protection operated from the diesel generator's control system, following the previous weekends planned outage. The diesel Generator controller triggered on overcurrent, and signalled to open the T1 33 kV circuit breaker. Historically the peak load demand in the area would not have triggered this element. The reverse flow from the generation now exceeds the level at which this element would operate. The generator protection element and ability to operate the circuit breaker have been disabled. An incident review has been undertaken and specific improvements have been identified as per Table 1, section 4.

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Actions from Incident reviews

Task	Planned start date	Planned Completion Date	Status
1. Network Planning			
Review of commissioning standards for substation works	Apr-26	EoFY	Contractor currently being engaged, awaiting proposal. **Update:** Initial meeting with consultant to agree scope. Proposal being constructed; expected 15 May 2026
Network wide network configuration review - recommended actions to follow	Mar-26	May-26	**Update**: We are currently more than 60% complete with a report that details network wide configuration improvements and currently on track to complete the report to provide network configuration recommendations
Critical spares review: 110 / 33 kV	May-26	Jul-26	Contractor has been engaged, ready to start in May.
Critical spares review: Distribution	Apr-27	Jun-27	
GHA switchgear investigation - other subs	Apr-26	EoFY	Initial review has confirmed two different wiring configuration inconsistencies found on GHA switchboards, and we are currently confirming the scope of work which is being done in concert with the ICAM report. This will form part of the scope and the contractor's proposal. **Update**: Contractor has indicated availability to commence project in August.
Diesel Generation connection points across the network	Apr-26	Complete	Diesel generation connection sites providing the best impact has been identified. The report has identified 18 locations that are suitable for Diesel generation points.
Review Security standard, and network compliance	Mar-26	May-26	**Update**: We are currently more than 60% complete with the review of security standards and network compliance and currently on track to complete the report to provide network security recommendations.
2. Processes			

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OT testing and Production Process review		Complete	1: NARs are to be raised for work on, or affecting, in-production OT systems, through the non-network application stream on EDNAR; 2: OT System Changes, modification and updates are not to be undertaken between 1100-1500, when network injection is ramping up/at peak.
Review utility scale DG planning processes, to include network wide protection and operational impacts.	Mar-26	Complete	A Review of the current process has been completed and several gaps have been identified. . **Update**: The following actions are required: 1. Creation of a Utility scale DG Process Document, that incorporates: - The End to End Process including the Process steps & stages, Technical Requirements from the solar farm based on the system size, Code compliance requirements, Internal requirements, Operational limits and requirements. Its expected that this document would clearly describe our process stages, internal and external requirments. 2. Early works agreement document which will form part of the quote and estimate to kick of the project with the customer. 3. Top Energy's Technical Standard Requirements (ST-E8.3.2-001) will be updated to incorporate Batteries, technical & process gaps and get cross reference into the 'Utility scale DG process document'
Contingency planning documentation	Apr-26	Complete	**Update**: Several key contingency documents have been published:

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			• Feeder Restoration Schedule, • Participant Rolling Outage, • Top Energy Control Centre and Lodestone Operational Coordination, • Top Energy Control Centre and Project Pukenui LP Operational Coordination, • Top Energy Control Centre and Twin River Solar Farm Operational Coordination, • 110kV contingency plan Guide for the KOE-KTA Line, • Embedded Generation Contingency Guide for the Northern Network.
Implement ANM for congestion management in TECC		Complete	
3. Protection			
Review Network wide Line-diff enablement		Complete	Confirmed all as expected.
Review alarm/notification of protection enablement		Complete	Process update, physical d/c of comms, prompts alarm at SCADA
Network wide protection Study	Apr-26	Sept-26	1. Ergo Consulting's protection team has been engaged to review our protection settings and co-ordination. The scope has identified 7 areas to be reviewed. The first stage includes the 'Evaluation of the suitability of settings & recommendations for revised settings, for KOE 110/33kV Substation Transformers'
4. Diesel Generation			
Upskill staff for generator control - at least two field staff TECS, three trained in TECC, two in engineering		Feb-27	Have approached specialist for training proposal to cover: • Staff training (contracting, engineering/maintenance, and Control Centre staff), covering: • Islanding and black start of the diesel generators (NGF + KTD and Omanania) • Operation and management of the generator controllers, both on site and via remote software

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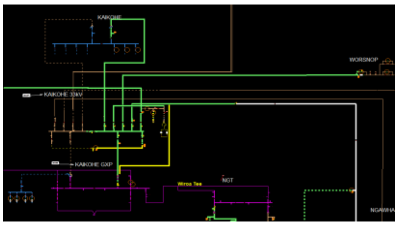
Kerikeri 0245, New Zealand
+64 (0)9 407 0600

			• Development and review of black start procedures for the Northern Network and Omanania • Testing the black start procedures for the above sites using the ADMS/NMS simulator • Review of system requirements and identification of any improvement opportunities. **Update:** Meeting held on 30 April 2026 between Planning and Operation teamsto undertake review of current practice of the Diesel controller. A follow-up meeting will take place 18 May 2026 to finalise way forward before further discussion with contractor (items above).
Review Planned, unplanned, islanding documentation – to review, ensure resynchronisation part is comprehensive	Apr-26	Jun-26	Document is under review for recommended changes and peer review to be done upon completion.
Review getting ADMS visibility and alarms of the generation control system	Apr-26	Complete	Enabled in ADMS
Switching Plan review to include the re-synchronisation stages, wording, and review process for specialist equipment or systems – to include peer review through specialist knowledge	Mar-26	Complete	Added to the switching processes
Review demarcation of responsibility between generation controller, TECC controller, On-site specialist etc	Mar-26	Apr-26	In progress

Appendix 9

Event #	Date/Time	Needs Clarifying?	Event
1	5:20:00 PM		*Outage Started, Top Energy Control Center sees alarm and instructs Faults Dispatch to deploy Graeme Boocock to site to investigate*
	5:20:00 PM	Needs Clarifying	*Substation Neighbour heard loud bang and called Fire Brigade*
	5.25:00PM		*Distibution Systems Manager rang and briefed Network Performance Manager*
	5.25:00Pm		*Network Perfrmance Manager rang and briefed Duty Manager*
	5.34:00		*Network Performance Manger Briefed GM Network*
	5:36:53 PM		*Fire Brigade crews dispatched for Fire And Emergency incident number F4329823 (Structure Fire)*
	5:44:00 PM		*Graeme Boocock saw black smoke exiting substation door on approach to site (time is approach time from Smartrak)*
5	5:47:00 PM		*Graeme Boocock arrived at Kaikohe GXP, 33kV Substation found with doors blown open and smoke pouring out, pvc type smell - reported back to TECC*
	6:00:00 PM		*Entry Approval EA-9346-F granted for Kaikohe 33kV Substation*
	6:00:00 PM		*Top Energy updated facebook app " Our crew have arrived at the the Kaikohe Substation and there appears to be substantial equipment failure on the 33kV switchgear"*
	6:00:00 PM	Needs Clarifying	*Fire Crews have been called to provide assistance in entering the building. "We will provide an update when we have more information"*
	6:07:15 AM		*Network Performance manager on site*
	6:10:00 PM	Needs Clarifying	*Fire Brigade on site*
		When was infrared inspection or thermal imaging?	*Without entering building (due to SF6 hazard), a hand held infrared camera was used to remotely to measure the temperature of circuit breakers. The temperature of circuit breaker #36 was found to be 10 degrees Celsius higher then the others.*
	6:17:00 PM		*Civil defence updated, Facebook app updated; uploaded Top Energy 6pm update*
	0/01/1900 6:24		*Network Performance Manager Updated CEO*
	6:55:00 PM		*TECCs are having trouble breathing inside the sub, requested for breathing apparatus, Fire brigade has no extras on hand, none out at Ngawha.*
	6:57:00 PM		*indication on ILIS relay in Suspect circuit breaker panel has inputs one and two flagged , three not flagged. This interprets as arcflash detected in the bus chamber and switchgear chamber and no arc flash detected in Cable box chamber.*
	6:57:00 PM		*Ollie is heading towards Kaikohe, with dive tanks for breathing assistance. He will head out to Omanaia afterwards.*
	7:10:00 PM		*AFFCO has expressed their concerns to TE as they are mid processing stock*
	7:10:00 PM		*Mt Pokaka has contactd TE, we explained there is an outage and some time before power is restored*
	7:15:00 PM		Report from field: Indications show arc flash and pressure indication for bus chamber and switchgear chamber on affected circuit breaker, moving to formally isolate one half of 33KV bus, and attempt to restore other half.
:	7:18:00 PM		*Few more TECCs may be needed to isolate supply further downstream.*
	7:25:00 PM		*Ngawha personnel heading to substation with fans and spare breathing gear they have.*
	7:30:00 PM		*Venting with fans powered by Portable Generators from Ngawha started*
	7:55:00 PM		*Accessed building to commence assessment of damage (Team assessed that fans had effectively dispursed fumes)*
	8:00:00 PM		*Working towards relivening half of the bus*
	8:06:00 PM		*Entered building and started Inspection of damaged structure*
	8:21:00 PM		*Access Permit AP-6640-F issued by Control Room to enable more in depth inspection of relevant equipment*
	8:45:00 PM		*More in depth investigation started*
	9:25:00 PM		*Bus livened half of 33KV*
	9:29:00 PM		*Kaikohe feeder is on*
	9:38:00 PM		*Omanaia Generators Started*
	9:50:00 PM		*All Kaikohe feeders except Awarua is on 18,800 customers off*
	10:11:00 PM		*Omanaia Feeders Tripped, Relivening Initiated*
	10:14:00 PM		*16,432 customers off supply*
	10:53:00 PM		*Kerikeri feeders are coming on*
	10:58:00 PM		*Omanaia Feeders Tripped, Relivening Initiated*
	11:45:00 PM		*Power fully restored*



Alternate Scenario Description

If the bus coupler protection had operated 163658 then the right hand side of the Kaikohe 33kV would have been isolated the fault. Differential Protection would have isolated CB0101 at Kaikohe, The 093302 Circuit Breaker at Worsnop and this would have also resulted in 160132 on the 110kv at Kaikohe Operating resulting in Top Energy maintaining power on its 33kV Ring, and also T2 the 110kV transformer at Kaikohe remaining on. Only Omanaia Substation and Ngawha's OEC3 would have lost power (OEC1 and OEC2 being out for maintenance)

Omanaia would then have been brought online in the short term via backfeeding from Kaikohe's Taheke Feeder, combined with voltage support from the Omanaia Generators.

However before entering the 33kV Substation, the Techs may have asked for the entire 33kV Switchboard which supplies the Southern Network to be shut down for one hour in order for the inspection to take place.

Total Top Energy Network ICP Count	36000
Southern Area Top Energy Network ICP	23468

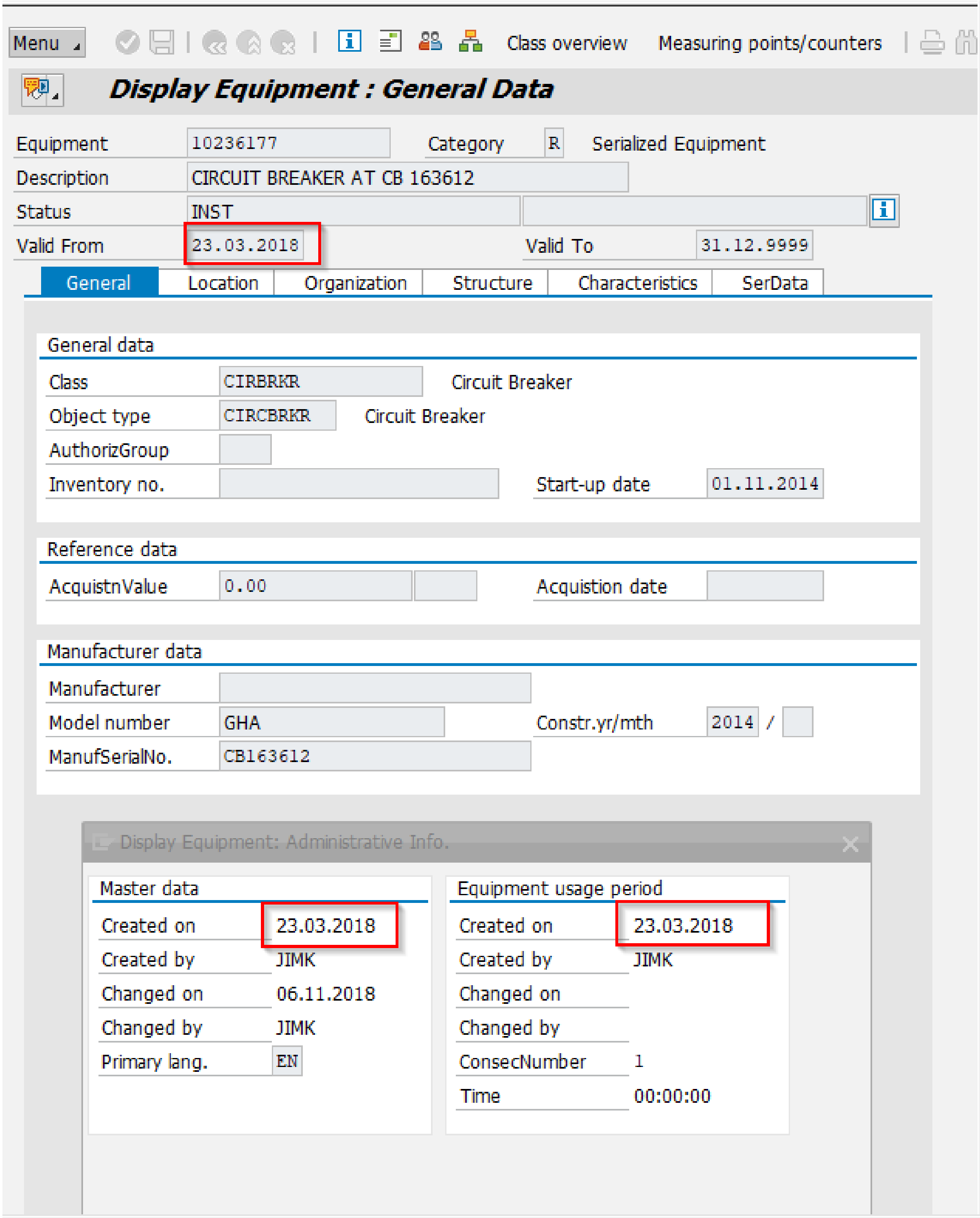
Switching Steps

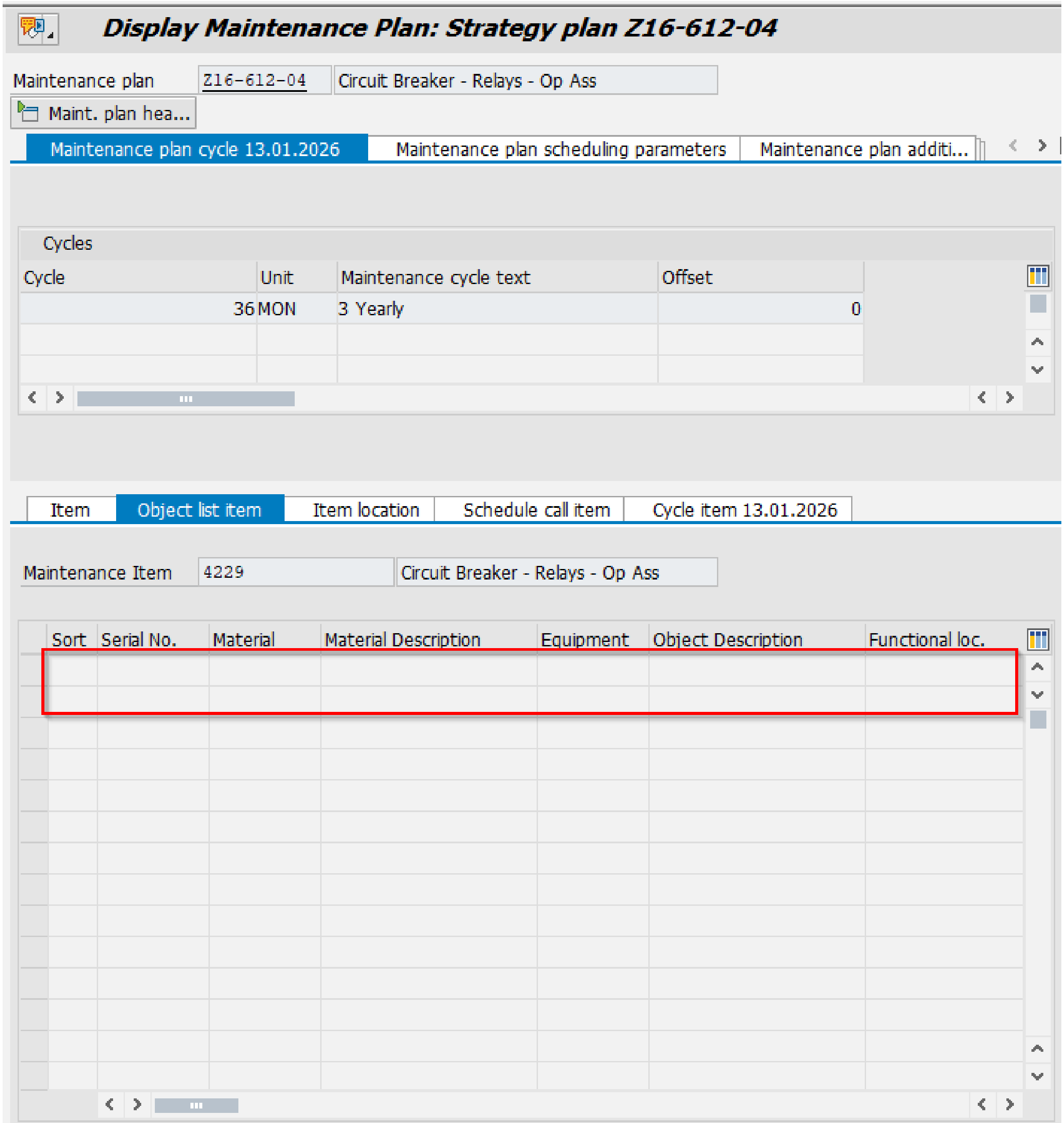
Step	Time	Description	ICPs Off	Stage ICPs On	Stage Duration (Minutes)	Stage Customer Minutes	Accumulated Customer Minutes	Stage SAIDI	Accumulated SAIDI	Comments
		Omanaia Substation Offline, Steps for restoring from Generators								
1	17:20:00	Fault on 33kV Bus Occurs, Omanaia Substation Offline	1943	-1943	0	0	0	0.00	0.00	Start of event
2	17:40:00	All ICPs fed from Omanaia Supply Off, Control Room Waits for loads to settle	1943	0	20	38860	38860	1.08	1.08	20 minute period for TECC to understand extent of tripping and allow for loads to settle
3	17:45:00	Omanaia Substation: Control Room Backfeeds Omanaia's Waima Feeder (443 ICPs) via Sectionaliser S1031 Omanaia Generators Started, but not yet Connected to Network	1500	443	5	7500	46360	0.21	1.29	Commence Implementing restore plan
4	17:45:00	Omanaia Substation: Reclosers and Sectionalisers Opened so that these feeders can be brought on in sections so as not to trip the generators Opononi's Feeder: Recloser R460 Opened. Switch 1818 Opened, Sectionalisers S1029 and S1033 Opened	1500	0	0	0	46360	0.00	1.29	
5	17:55:00	Omanaia Substation: Rawene Feeder Circuit Breaker Closed (C051742)	1101	399	10	11010	57370	0.31	1.59	
6	18:00:00	Omanaia Substation: Opononi Feeder Circuit Breaker Closed, turns on initial segment of feeder	1046	55	5	5230	62600	0.15	1.74	
7	18:05:00	Omanaia Substation: Sectionaliser S1033 C	842	204	5	4210	66810	0.12	1.86	
8	18:10:00	Omanaia Substation: Sectionaliser S1029 C	409	433	5	2045	68855	0.06	1.91	
9	18:15:00	Omanaia Substation: Switch 1818 Closed	263	146	5	1315	70170	0.04	1.95	
10	18:20:00	Omanaia Substation: Recloser R460 Closed	0	263	5	0	70170	0.00	1.95	Omanaia sub station restored on generators (35 minutes to switch)
		33kV Switchboard Turned Off Turning Off Southern Network. Disconnect Omanaia from Network (Island Mode)								Omania retains power, but switched to island mode
11	19:55:00	Technicians on site wait for fumes to dispurse from substation before entering	0	0	155	0	70170	0.00	1.95	
12	20:55:00	Entire Substation 33kV Switchboard Turned Off for one hour so that Technicians can safely inspect the switchboard for damage This removes power for the entire TOP Energy Southern Network	21525	-21525	60	1291500	1361670	35.88	37.82	
13	20:57:00	Kaikohe Substation, CB0107 Kaikohe Feeder Switched On	20272	1253	2	40544	1402214	1.13	38.95	Southern Network restoration commences
14	20:58:00	Kaikohe Substation, CB0106 NCRF (Prison) Feeder Switched On	20271	1	1	20271	1422485	0.56	39.51	
15	21:00:00	Kaikohe Substation, CB0109 Taheke Feeder Switched On	20055	216	2	40110	1462595	1.11	40.63	
16	21:02:00	Kaikohe Substation, CB0110 Ohaeawai Feeder Switched On	19210	845	2	38420	1501015	1.07	41.69	
17	21:05:00	Kaikohe Substation, CB0110 Horeke Feeder Switched On	18498	712	3	55494	1556509	1.54	43.24	
18	21:08:00	Kaikohe Substation, CB0110 Rangiahua Feeder Switched On	17668	830	3	53004	1609513	1.47	44.71	
19	21:10:00	Kaikohe Substation, CB0110 Awarua Feeder Switched On	16585	1083	2	33170	1642683	0.92	45.63	
20	21:15:00	Moerewa Substation, Pokapu Feeder Switched On	16286	299	5	81430	1724113	2.26	47.89	
21	21:15:00	Moerewa Substation, Moerewa Feeder Switched On	15723	563	0	0	1724113	0.00	47.89	
22	21:19:00	Moerewa Substation, Tau Block Feeder Switched On	15622	101	4	62488	1786601	1.74	49.63	
23	21:20:00	Kawakawa Substation, Kawakawa Feeder Switched On	15217	405	1	15217	1801818	0.42	50.05	
24	21:25:00	Kawakawa Substation, Opua Feeder Switched On	14277	940	5	71385	1873203	1.98	52.03	
25	21:25:00	Kawakawa Substation, Russell Express Feeder Switched On	13592	685	0	0	1873203	0.00	52.03	
26	21:27:00	Kawakawa Substation, Towai Feeder Switched On	13109	483	2	26218	1899421	0.73	52.76	
27	21:29:00	Kawakawa Substation, Karetu Feeder Switched On	12912	197	2	25824	1925245	0.72	53.48	
28	21:30:00	Kerikeri Substation, Inlet Rd Feeder Switched On	12029	883	1	12029	1937274	0.33	53.81	
29	21:35:00	Kerikeri Substation, Cobham Rd Feeder Switched On	11448	581	5	57240	1994514	1.59	55.40	
30	21:37:00	Kerikeri Substation, Ranui Feeder Switched On	10880	568	2	21760	2016274	0.60	56.01	
31	21:39:00	Kerikeri Substation, Kerikeri Feeder Switched On	10482	398	2	20964	2037238	0.58	56.59	
32	21:40:00	Kerikeri Substation, Hone Heke Feeder Switched On	9883	599	1	9883	2047121	0.27	56.86	
33	21:44:00	Mt Pokaka Substation, Crossroads Feeder Switched On	9231	652	4	36924	2084045	1.03	57.89	
34	21:46:00	Mt Pokaka Substation, Timber Mil Feeder Switched On	9227	4	2	18454	2102499	0.51	58.40	
35	22:03:00	Kerikeri Substation, Shepherd Rd Feeder Switched On	8959	268	17	152303	2254802	4.23	62.63	
36	22:04:00	Mt Pokaka Substation, Bulls Gorge Feeder Switched On	8756	203	1	8756	2263558	0.24	62.88	
37	22:05:00	Haruru Substation, Te Kemara Feeder Switched On	8354	402	1	8354	2271912	0.23	63.11	
38	22:13:00	Haruru Substation, Joyces Rd Feeder Switched On	6936	1418	8	55488	2327400	1.54	64.65	
39	22:15:00	Haruru Substation, Onewhero Feeder Switched On	6820	116	2	13640	2341040	0.38	65.03	
40	22:16:00	Haruru Substation, Ti Bay Feeder Switched On	6051	769	1	6051	2347091	0.17	65.20	
41	22:17:00	Haruru Substation, Puketona Feeder Switched On	5696	355	1	5696	2352787	0.16	65.36	
42	22:17:00	Waipapa Substation, Riverview Feeder Switched On	4402	1294	0	0	2352787	0.00	65.36	
43	22:18:00	Waipapa Substation, WPA Business Park Feeder Switched On	4361	41	1	4361	2357148	0.12	65.48	
44	22:19:00	Waipapa Substation, Aerodrome Feeder Switched On	4015	346	1	4015	2361163	0.11	65.59	
45	22:20:00	Waipapa Substation, Puketi Feeder Switched On	3444	571	1	3444	2364607	0.10	65.68	
46	22:21:00	Waipapa Substation, Purerua Feeder Switched On	2354	1090	1	2354	2366961	0.07	65.75	
47	22:22:00	Kaeo Substation, Matauri Bay Feeder Switched On	1961	393	1	1961	2368922	0.05	65.80	
48	22:23:00	Kaeo Substation, Totara North Feeder Switched On	1387	574	1	1387	2370309	0.04	65.84	
49	22:33:00	Kaeo Substation, Orotere Feeder Switched On	1219	168	10	12190	2382499	0.34	66.18	
50	22:34:00	Waipapa Substation, Takou Bay Feeder Switched On	603	616	1	603	2383102	0.02	66.20	
51	22:35:00	Kaeo Substation, Whangaroa Feeder Switched On	114	489	1	114	2383216	0.00	66.20	
52	22:36:00	Kaeo Substation, Omaunu Feeder Switched On	0	114	1	0	2383216	0.00	66.20	Restored

Appendix 10

Planning for maintenance and budgeting for 17-18 was to be submitted in September 16.

At that time there was no ASBUILD information as to what had been installed nor equipment created in SAP. The SAP equipment was eventually created [CBs] right at the end of FYE18 by which time the program for that FY was already in progress.

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Maintenance plan
Z16-612-04
Circuit Breaker - Relays - Op Ass
Maint. plan hea...
Maintenance plan cycle 13.01.2026
Maintenance plan scheduling parameters
Maintenance plan additi...
Cycles
Cycle
Unit
Maintenance cycle text
Offset
36
MON
3 Yearly
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Item
Object list item
Item location
Schedule call item
Cycle item 13.01.2026
Maintenance Item
4229
Circuit Breaker - Relays - Op Ass
Sort
Serial No.
Material
Material Description
Equipment
Object Description
Functional loc.

Northpower

Wednesday, December 9, 2020

P12 - Circuit Breaker Maintenance

Substation
Kaikohe

Voltage
33

Job Number
TC1135682

CB Number
163612

Inspector
Mark Robson

Date of Inspection
Thursday, December 10, 2020

This form details the data capture requirements for the CB Maintenance/Service work. Typical time between service intervals is 4 yearly or as required.

The form is general and to be used for all types of circuit breakers. For the specific work instructions please refer to relevant documentation for the specific type of CB.

Test Equipment Data Capture

	Manufacturer	Model	Serial	Calibration Date
Unit 1	Camlin	P3-0701-180883	100-01779	16-09-20
Unit 2				
Unit 3				
Unit 4				

Visual and Mechanical Checks

	A	B	C	NA	Refer to Detail
Check CB Labelling	✓				

	A	B	C	NA	Refer to Detail
Alarms and Relay Flags Reset	✓				
Check Earth Contacts				✓	
Check Earth Bonds	✓				
Test CB Operation & Indication	✓				
Droppers and Connection to OH Bus				✓	

Comments + Defects

Battery Inspection and Defects

	1	2	3	4
R - Circuit Site				
R - Bus Side				
Y - Circuit Side				
Y - Bus Side				
B - Circuit Side				
B - Bus Side				

Comments + Defects

Upload Pictures of Defects

Withdrawable Breakers

	A	B	C	NA	Refer to Detail
Discharge any stored energy in springs					
Rack down CB, check operation of mechanism and remove from panel					

	A	B	C	NA	Refer to Detail
Check interior of panel fro any signs of discharge (shutters and operating mechnisms), Clean as requried.					
Inspect CB Truck for any signs of damage (e.g. discharge on top of tank)					
Check Bushings for Damage and Clean					
Check Isolation Contacts on Bushings					
Check Contact Assembly for Loose Connection with Bushings					
Check Contact Assemble for Tightness and Signs of Damage					
Check and Clean Auxiliary Contacts					
Clean and Lubricate Mechanism					
Check Interlocks					
Raise & Lower Mechanism					
Check Explosion Vents (OCB)					

Climatic Conditions

	Value
Ambient Temperature (C)	19
Humidity (%)	76

Typical values for Vacuum and SF6 CBs are between 30 and 50 microhms, the measured value shall not exceed 100 microhms.

For oil CBs the values are typically between 50 and 120 microhms, the measured value shall not exceed 200 microhms.

Alarm/Indication Checks

	Local	Remote	SCADA
Open	✓	✓	✓
Close	✓	✓	✓
Isolate	✓		
Spring Discharged	✓		
CB on Manual	✓		
CB on Local	✓		
Low Gas Pressure	✓		
Gas Pressure Lockout			
Spring Motor Fault	✓		

Upload Pictures of Defects

Completion Tasks

CB Returned to Normal State	Yes
Site Cleaned	Yes
All Panels/Cabinets Closed	Yes
Permit Returned and CB Functional	Yes

Signature of Inspector

Northpower

P17B - Numeric Relay Test

Substation
Kaitaia

Job Number
TC1135682

Inspector
Ian Reed

Date of Inspection
Thursday, December 10, 2020

Data Capture

	Detail
Relay Manufacturer	SEL
Model	351S
Serial Number	1133640548
Function	OC EF
Phase	RWBN
CT Ratio	1200
Configuration	CB163612
Input Current	1
Case Style	
Firmware	351S 7 R515 V0 Z105104 SD20130620

Form Fields:

- A = OK, complete, no defects
- B = Defect was fixed (only where repairs made)
- C = Follow up for Investigation

External Inspection

	Checked	OK	Defect (Refer Defects)
Check Relay for External Signs of Damage	✓		
Check all Terminals are Secure on Relay and Switchgear	✓		
Check Watchdog LED	✓		

Relay Test

	Checked	OK	Defect (Refer Defects)
Test Data Entered in Test Database	✓		
Download Fault Log Data and Reset Log	✓		
Check and Compare Relay File and Master File Using Relay Software or Manual Checking Processs			✓

Relay Test Notes

No Settings file supplied to compare to

Binary Inputs, Binary Outputs and LED Checks

	Checked	OK	Defect (Refer Defects)
Check all Binary Inputs are Working Correctly	✓		
Check all Binary Outputs are Working Correctly	✓		
Check all Annunciators and LED's are Workign Correctly	✓		

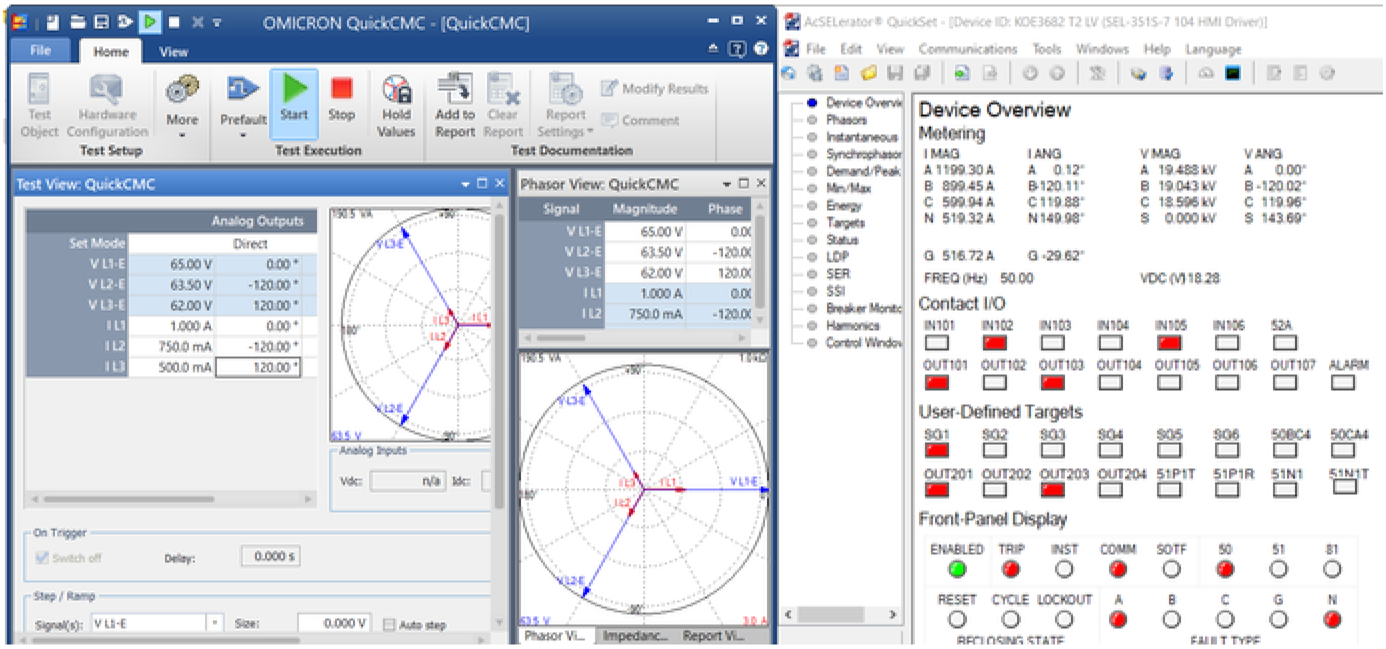
SCADA Testing

	Checked	OK	Defect (Refer Defects)
Check that Circuit Breaker Trips Correctly from Relay	✓		
Check all Alarm Indications Locall and Received by System Control			✓
Check System Control can Open and Close Circuit Breaker via SCADA			✓
Circuit Breaker Returned to Service	✓		

SCADA Testing Notes

No Relay alarms or CB alarms seen at control

Upload Screenshots of Tests (where applicable)



CB163612 Screen Capture.PNG

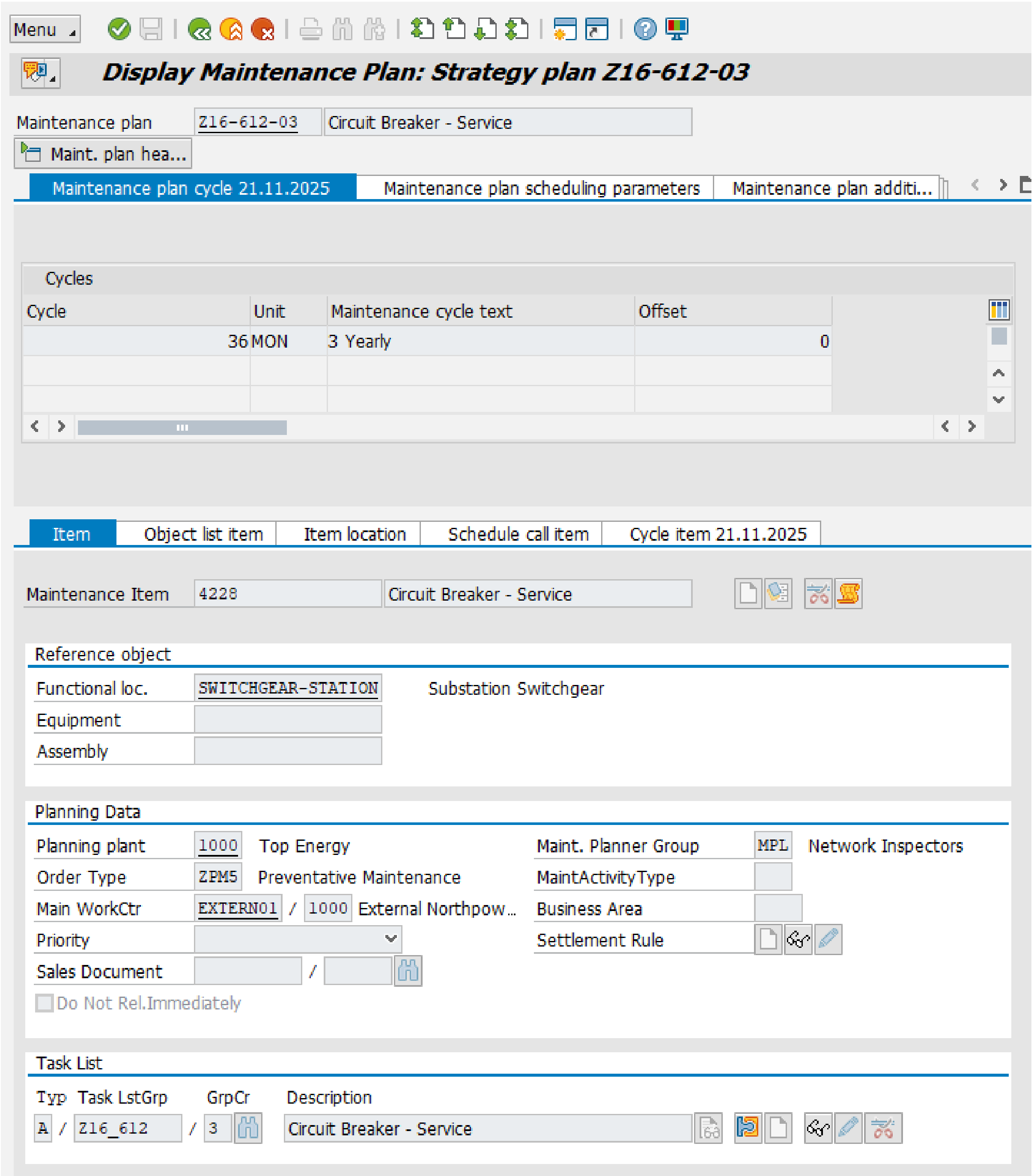
docx CB163612 History.docx

Tasks

	A	B	C	NA	Refer to Detail
1700 - Relay Faulty - Replace	✓				
1701 - Relay Faulty - Repair	✓				
1702 - Cannot Calibrate	✓				
1703 - Wiring Fault	✓				
1704 - Miscellaneous					✓

Comments + Defects

No Relay alarms or CB alarms seen at control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Maintenance plan Z16-612-03 Circuit Breaker - Service
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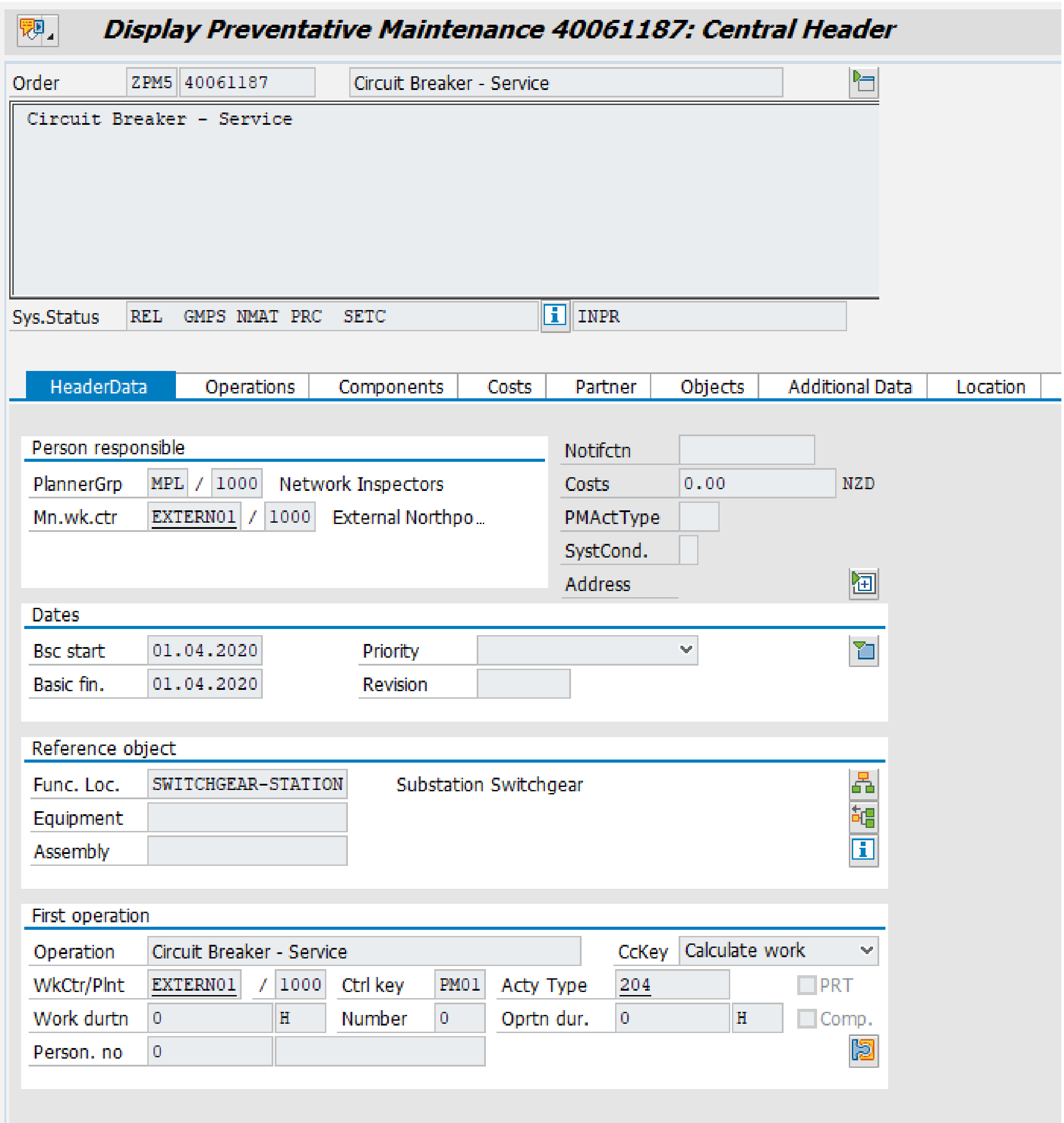
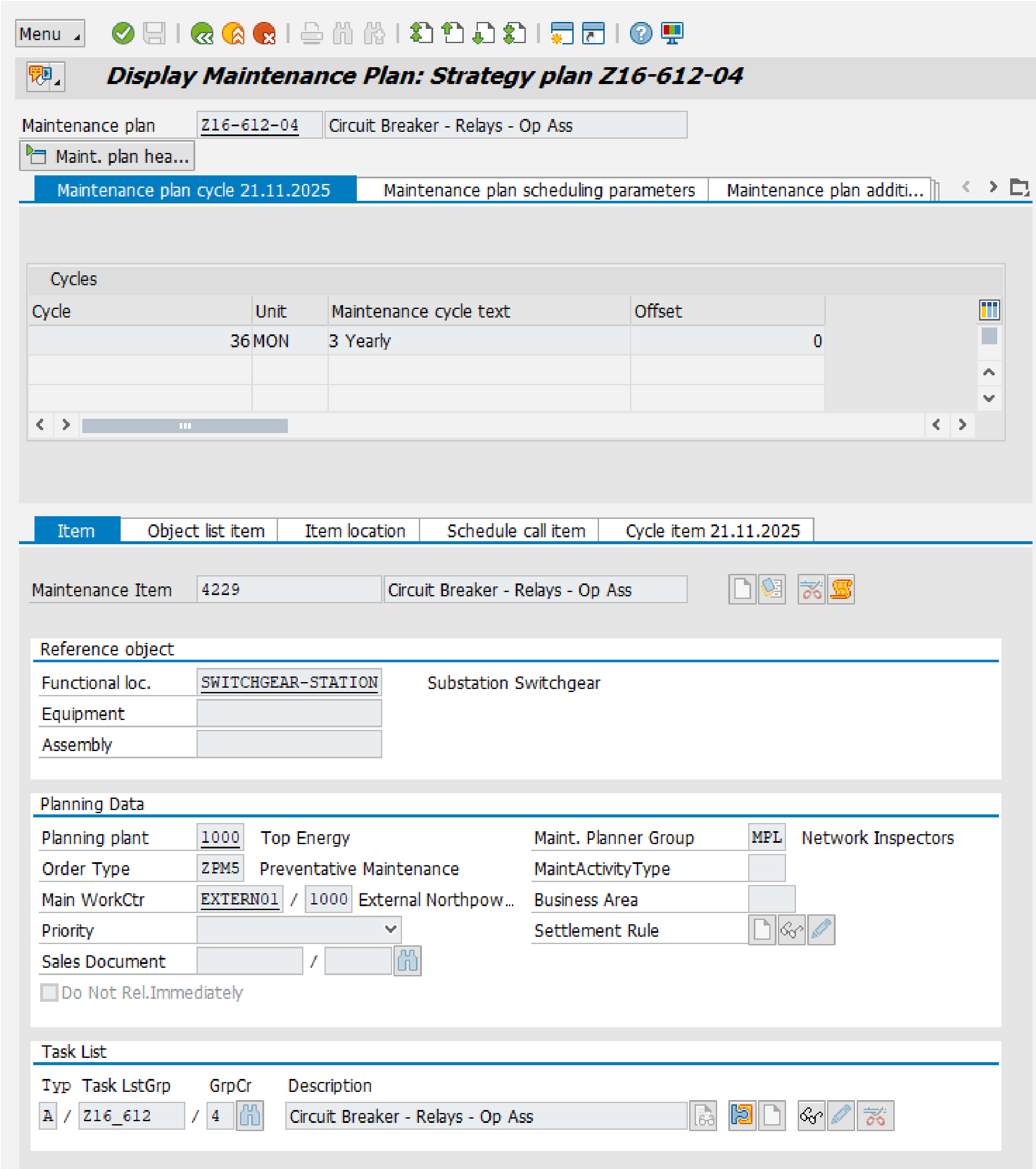
Maintenance plan cycle 21.11.2025
Maintenance plan scheduling parameters
Maintenance plan additi...
Cycles
Cycle
Unit
Maintenance cycle text
Offset
36 MON 3 Yearly 0
Item
Object list item
Item location
Schedule call item
Cycle item 21.11.2025
Maintenance Item 4228 Circuit Breaker - Service
Reference object
Functional loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
Planning Data
Planning plant 1000 Top Energy
Maint. Planner Group MPL Network Inspectors
Order Type ZPM5 Preventative Maintenance
MaintActivityType
Main WorkCtr EXTERN01 / 1000 External Northpow...
Business Area
Priority
Settlement Rule
Sales Document /
Do Not Rel.Immediately
Task List
Typ Task LstGrp GrpCr Description
A / Z16_612 / 3 Circuit Breaker - Service



Display Preventative Maintenance 40061187: Central Header
Order ZPM5 40061187 Circuit Breaker - Service
Circuit Breaker - Service
Sys.Status REL GMPS NMAT PRC SETC
INPR
HeaderData
Operations
Components
Costs
Partner
Objects
Additional Data
Location
Person responsible
PlannerGrp MPL / 1000 Network Inspectors
Mn.wk.ctr EXTERN01 / 1000 External Northpo...
Notifctn
Costs 0.00 NZD
PMActType
SystCond.
Address
Dates
Bsc start 01.04.2020
Basic fin. 01.04.2020
Priority
Revision
Reference object
Func. Loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
First operation
Operation Circuit Breaker - Service
CcKey Calculate work
WkCtr/Plnt EXTERN01 / 1000
Ctrl key PM01
Acty Type 204
PRT
Work durtn 0 H
Number 0
Oprtn dur. 0 H
Comp.
Person. no 0



Menu
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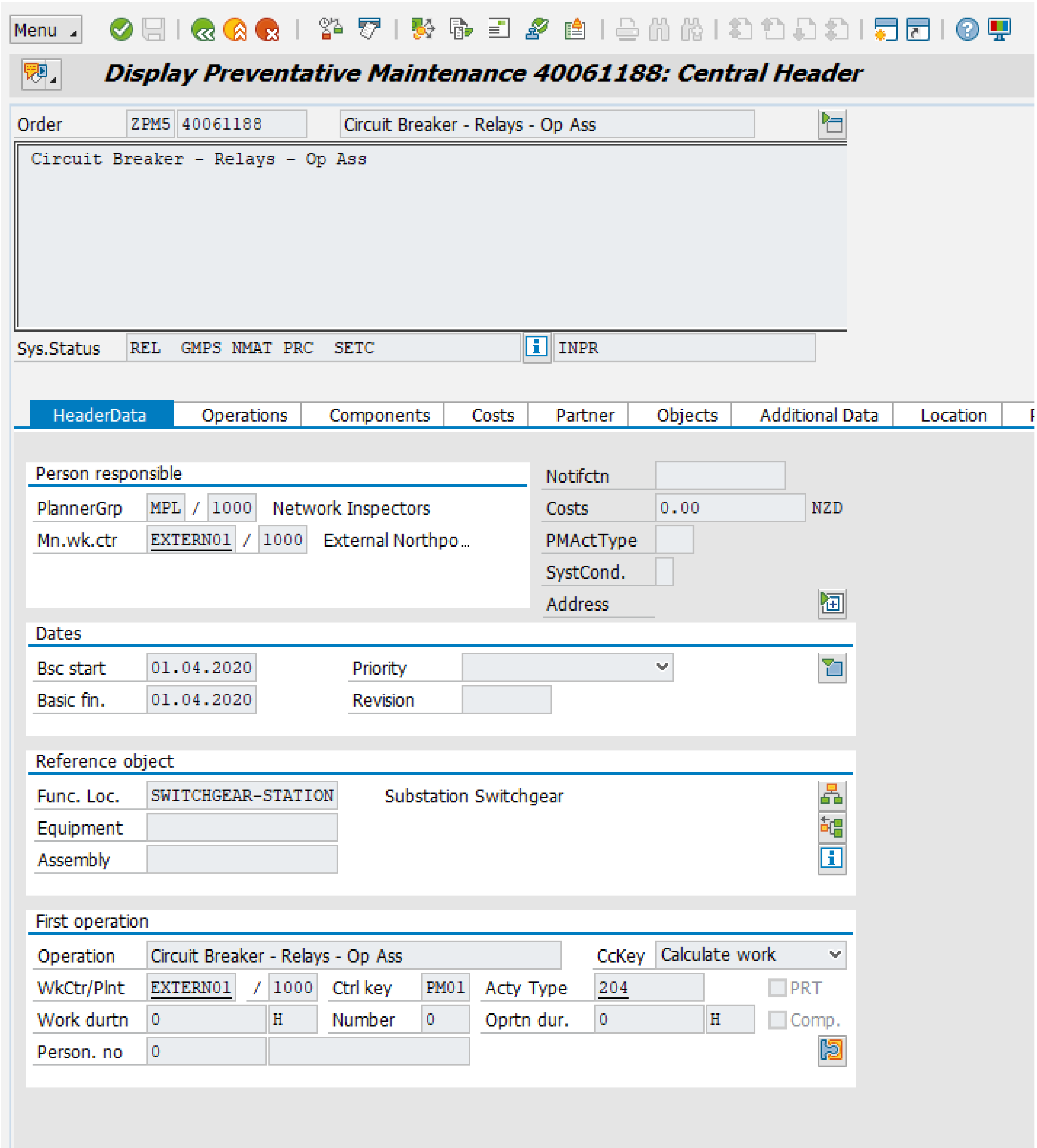
Maintenance plan
Z16-612-04
Circuit Breaker - Relays - Op Ass
Maint. plan hea...
Maintenance plan cycle 21.11.2025
Maintenance plan scheduling parameters
Maintenance plan additi...
Cycles
Cycle
Unit
Maintenance cycle text
Offset
36
MON
3 Yearly
0
Item
Object list item
Item location
Schedule call item
Cycle item 21.11.2025
Maintenance Item
4229
Circuit Breaker - Relays - Op Ass
Reference object
Functional loc.
SWITCHGEAR-STATION
Substation Switchgear
Equipment
Assembly
Planning Data
Planning plant
1000
Top Energy
Maint. Planner Group
MPL
Network Inspectors
Order Type
ZPM5
Preventative Maintenance
MaintActivityType
Main WorkCtr
EXTERN01
/
1000
External Northpow...
Business Area
Priority
Settlement Rule
Sales Document
/
Do Not Rel.Immediately
Task List
Typ
Task LstGrp
GrpCr
Description
A
/
Z16_612
/
4
Circuit Breaker - Relays - Op Ass


Menu
Display Preventative Maintenance 40061188: Central Header
Order ZPM5 40061188 Circuit Breaker - Relays - Op Ass
Circuit Breaker - Relays - Op Ass
Sys.Status REL GMPS NMAT PRC SETC INPR
HeaderData Operations Components Costs Partner Objects Additional Data Location
Person responsible
PlannerGrp MPL / 1000 Network Inspectors
Mn.wk.ctr EXTERN01 / 1000 External Northpo...
Notifctn
Costs 0.00 NZD
PMActType
SystCond.
Address
Dates
Bsc start 01.04.2020
Basic fin. 01.04.2020
Priority
Revision
Reference object
Func. Loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
First operation
Operation Circuit Breaker - Relays - Op Ass
CcKey Calculate work
WkCtr/Plnt EXTERN01 / 1000
Ctrl key PM01
Acty Type 204
PRT
Work durtn 0 H
Number 0
Oprtn dur. 0 H
Comp.
Person. no 0

Northpower

P08E - General Substation Inspection

Substation	Kaikohe 33KV	**Job Number**	Tc4142846
Inspector	Glenn Emery	**Date of Inspection**	Thursday, July 24, 2025

Tasks

	A	B	C	NA	Refer to Detail
800 - Fences	✓				
808 - Lighting	✓				
809 - Security Alarm	✓				
810 - RT				✓	
811 - Oil Spill Kit	✓				
812 - Power Sockets and Heaters	✓				
813 - Ventilation/Air Conditioning	✓				
816 - Trench Covers	✓				
818 - Building Misc	✓				
1204 - CB Labels	✓				
1211 - Circuit Breaker SF6 Gas Low	✓				
1221 - Circuit Breaker Misc	✓				
1704 - Protection Relay Misc	✓				
2000 - RTU	✓				
2001 - Radio Comms	✓				
2009 - Comms Misc	✓				
1105 - Transformer Oil Leak			✓		✓
1106 - Transformer Oil Level	✓				
1110 - Breather Faulty	✓				
1111 - Transformer Buzholz	✓				
1112 - Transformer Winding/Oil Temp	✓				
1115 - Transformer Fans				✓	

	A	B	C	NA	Refer to Detail
1117 - Transformer Tap Changer	✓				
1122 - Transformer Misc	✓				
1124 - Transformer Silica Gel	✓				
1309 - Outdoor Structure Misc	✓				
1802 - Oil Containment Misc			✓		✓
1911 - Ripple Plant Misc				✓	
1607 - Capacitor Bank Misc				✓	

Comments + Defects

Petro plugs not working in T11 bund and bund holding water so I removed the plugs and drained the water out as it was just water
Feet onT12 radiators need rust treatment and painting
Small oil leak from the top of T12
Rust on feet of radiators onT11

Battery Inspection and Defects

	A	B	C	Refer to Defects for Detail
1000 - Battery Cell Defective	✓			
1001 - Battery Bank Defective	✓			
1002 - Charger Defective	✓			
1003 - Cabinet Ventilation	✓			
1004 - Corrosion on Terminals	✓			
1005 - Leads/Connections	✓			
1006 - Bank Stand Deteriorated	✓			
1010 - Other Misc	✓			

Charger Data Capture

	Output Voltage (VDC)	Output Current (A)
Bank 1	123.3V	5A
Bank 2	27.2V	1A
Bank 3	123.3V	1A
Bank 4	27.2V	1A

Battery Comments + Defects

Upload Pictures of Defects

Upload Any Further Pictures of Interest

Inspection Completion Notes

Completion Tasks

All LV Panels Checked for Tripped Breakers	Yes
All Cabinet Doors Closed	Yes
Air Conditioning is On	Yes
Electric Fence is On	Yes
All Rubbish Removed	Yes
RT Working (If Applicable)	Yes
All Windows and Doors Locked	Yes
All Gates Locked	Yes
Sepa System OK - Check for sump level/bund issues etc.	NA

Signature of Inspector

Northpower

P08E - General Substation Inspection

Substation	Kaikohe 33kv	**Job Number**	TC4142846
Inspector	Tony Quinn	**Date of Inspection**	Thursday, August 21, 2025

Tasks

	A	B	C	NA	Refer to Detail
800 - Fences	✓				
808 - Lighting					✓
809 - Security Alarm	✓				
810 - RT	✓				
811 - Oil Spill Kit	✓				
812 - Power Sockets and Heaters	✓				
813 - Ventilation/Air Conditioning	✓				
816 - Trench Covers	✓				
818 - Building Misc	✓				
1204 - CB Labels	✓				
1211 - Circuit Breaker SF6 Gas Low	✓				
1221 - Circuit Breaker Misc	✓				
1704 - Protection Relay Misc	✓				
2000 - RTU	✓				
2001 - Radio Comms	✓				
2009 - Comms Misc	✓				
1105 - Transformer Oil Leak					✓
1106 - Transformer Oil Level	✓				
1110 - Breather Faulty	✓				
1111 - Transformer Buzholz	✓				
1112 - Transformer Winding/Oil Temp	✓				
1115 - Transformer Fans				✓	

	A	B	C	NA	Refer to Detail
1117 - Transformer Tap Changer	✓				
1122 - Transformer Misc					✓
1124 - Transformer Silica Gel	✓				
1309 - Outdoor Structure Misc				✓	
1802 - Oil Containment Misc					✓
1911 - Ripple Plant Misc				✓	
1607 - Capacitor Bank Misc				✓	

Comments + Defects

Lighting defects repair planned. T11 pump repair planned.
Transformer leaks and rust repairs to be agreed.

Battery Inspection and Defects

	A	B	C	Refer to Defects for Detail
1000 - Battery Cell Defective	✓			
1001 - Battery Bank Defective	✓			
1002 - Charger Defective	✓			
1003 - Cabinet Ventilation	✓			
1004 - Corrosion on Terminals	✓			
1005 - Leads/Connections	✓			
1006 - Bank Stand Deteriorated	✓			
1010 - Other Misc	✓			

Charger Data Capture

	Output Voltage (VDC)	Output Current (A)
Bank 1	27.2	1.0
Bank 2	123.2	1.0
Bank 3	27.1	1.0
Bank 4	122.2	5.0

Battery Comments + Defects

Battery alarms tested and seen in control on old Ifix system, but nothing happened on new ADMS after approximately 4 minutes.

Upload Pictures of Defects

Upload Any Further Pictures of Interest

Inspection Completion Notes

Completion Tasks

All LV Panels Checked for Tripped Breakers	Yes
All Cabinet Doors Closed	Yes
Air Conditioning is On	Yes
Electric Fence is On	Yes
All Rubbish Removed	Yes
RT Working (If Applicable)	Yes
All Windows and Doors Locked	Yes
All Gates Locked	
Sepa System OK - Check for sump level/bund issues etc.	NA

Signature of Inspector

Northpower

P08E - General Substation Inspection

Substation	Kaikohe 33kv	**Job Number**	Tc4142846
Inspector	Mark Robson	**Date of Inspection**	Monday, September 29, 2025

Tasks

	A	B	C	NA	Refer to Detail
800 - Fences	✓				
808 - Lighting			✓		✓
809 - Security Alarm	✓				
810 - RT	✓				
811 - Oil Spill Kit	✓				
812 - Power Sockets and Heaters	✓				
813 - Ventilation/Air Conditioning	✓				
816 - Trench Covers	✓				
818 - Building Misc			✓		✓
1204 - CB Labels	✓				
1211 - Circuit Breaker SF6 Gas Low	✓				
1221 - Circuit Breaker Misc	✓				
1704 - Protection Relay Misc	✓				
2000 - RTU	✓				
2001 - Radio Comms	✓				
2009 - Comms Misc	✓				
1105 - Transformer Oil Leak			✓		✓
1106 - Transformer Oil Level	✓				
1110 - Breather Faulty	✓				
1111 - Transformer Buzholz	✓				
1112 - Transformer Winding/Oil Temp	✓				
1115 - Transformer Fans				✓	

	A	B	C	NA	Refer to Detail
1117 - Transformer Tap Changer	✓				
1122 - Transformer Misc			✓		✓
1124 - Transformer Silica Gel	✓				
1309 - Outdoor Structure Misc	✓				
1802 - Oil Containment Misc			✓		✓
1911 - Ripple Plant Misc				✓	
1607 - Capacitor Bank Misc				✓	

Comments + Defects

Roof leaking
Water in basement
Lights no go in sw rm
Water proofing coming away from building
O/s lights failing on blast wall
Rust on tx
Oil leak T12
T11 and T12 bund not draining water
Rusty flange on T11
T11 oil pump leaking

Battery Inspection and Defects

	A	B	C	Refer to Defects for Detail
1000 - Battery Cell Defective	✓			
1001 - Battery Bank Defective	✓			
1002 - Charger Defective	✓			
1003 - Cabinet Ventilation	✓			
1004 - Corrosion on Terminals	✓			
1005 - Leads/Connections	✓			
1006 - Bank Stand Deteriorated	✓			
1010 - Other Misc	✓			

Charger Data Capture

	Output Voltage (VDC)	Output Current (A)
Bank 1	122.4	1
Bank 2	27	1
Bank 3	122.4	5
Bank 4	27	1

Battery Comments + Defects

Upload Pictures of Defects









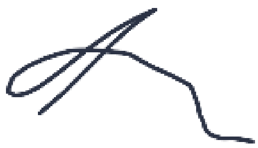
Upload Any Further Pictures of Interest

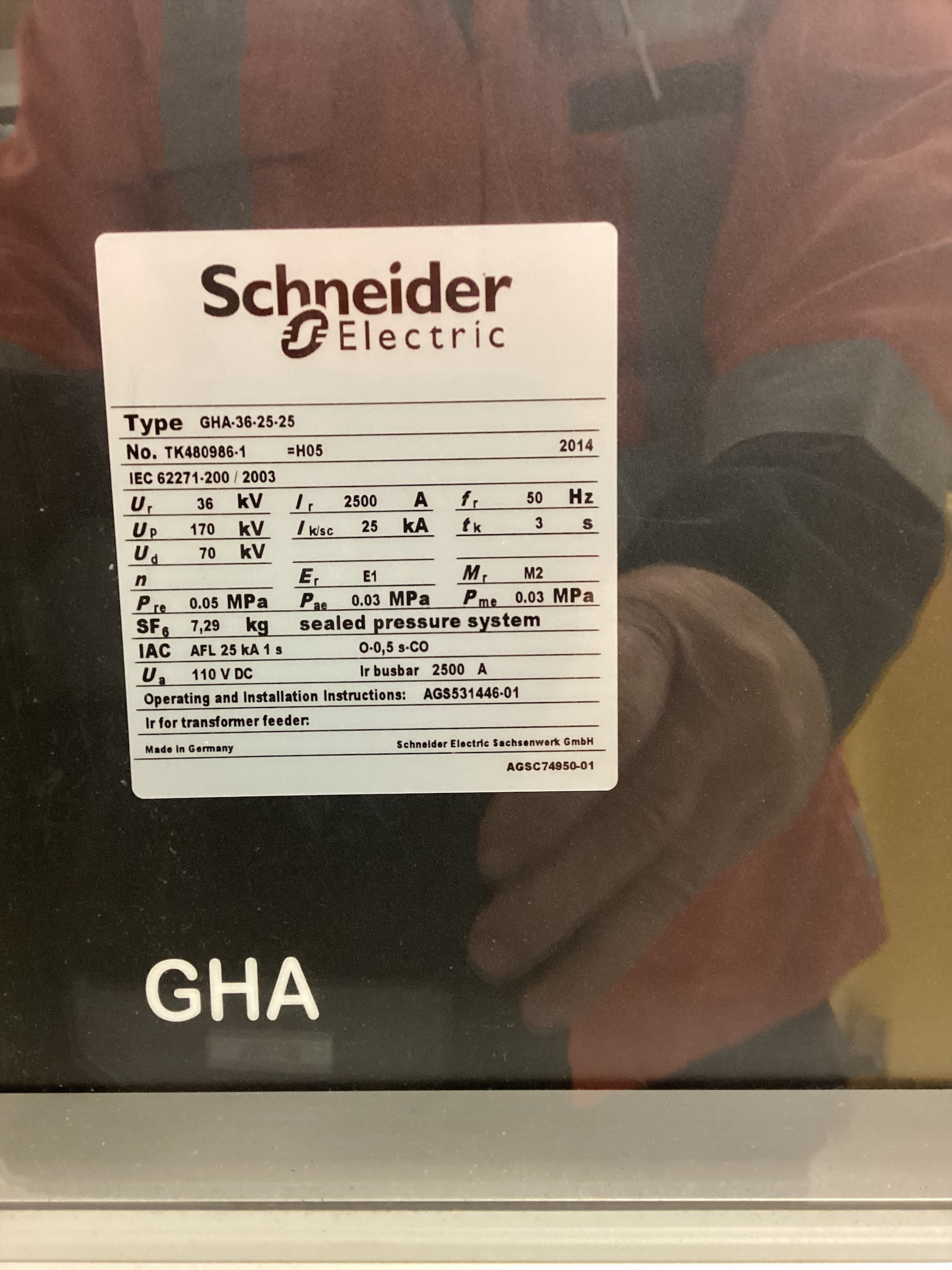
Inspection Completion Notes

Completion Tasks

All LV Panels Checked for Tripped Breakers	Yes
All Cabinet Doors Closed	Yes
Air Conditioning is On	Yes
Electric Fence is On	Yes
All Rubbish Removed	NA
RT Working (If Applicable)	NA
All Windows and Doors Locked	Yes
All Gates Locked	Yes
Sepa System OK - Check for sump level/bund issues etc.	NA

Signature of Inspector




Schneider Electric
Type GHA-36-25-25
No. TK480986-1 =H05 2014
IEC 62271-200 / 2003
U_r 36 kV I_r 2500 A f_r 50 Hz
U_p 170 kV $I_{k/sc}$ 25 kA t_k 3 s
U_d 70 kV
n E_r E1 M_r M2
P_{re} 0.05 MPa P_{ae} 0.03 MPa P_{me} 0.03 MPa
SF_6 7,29 kg sealed pressure system
IAC AFL 25 kA 1 s O-0,5 s-CO
U_a 110 V DC Ir busbar 2500 A
Operating and Installation Instructions: AGS531446-01
Ir for transformer feeder:
Made in Germany
Schneider Electric Sachsenwerk GmbH
AGSC74950-01
GHA

CB OPEN
CB CLOSED
DS OPEN
DS CLOSED
ES OPEN
ES CLOSED
CB SPRING CHARGED
CB OFF
CB ON
LAMP TEST
CB CONTROL SWITCH
LOCAL REMOTE
Incomer T3
CB163612
3614
3619
3612
Schneider Electric
GHA
Sperre Handnotbetätigung
Lockout Manual Drive
max. 200/min

Test report

CB163612 T3 Incomer Close

Supervisor ______________________

Operator . ______________________

Note

-

____

Signature

General data

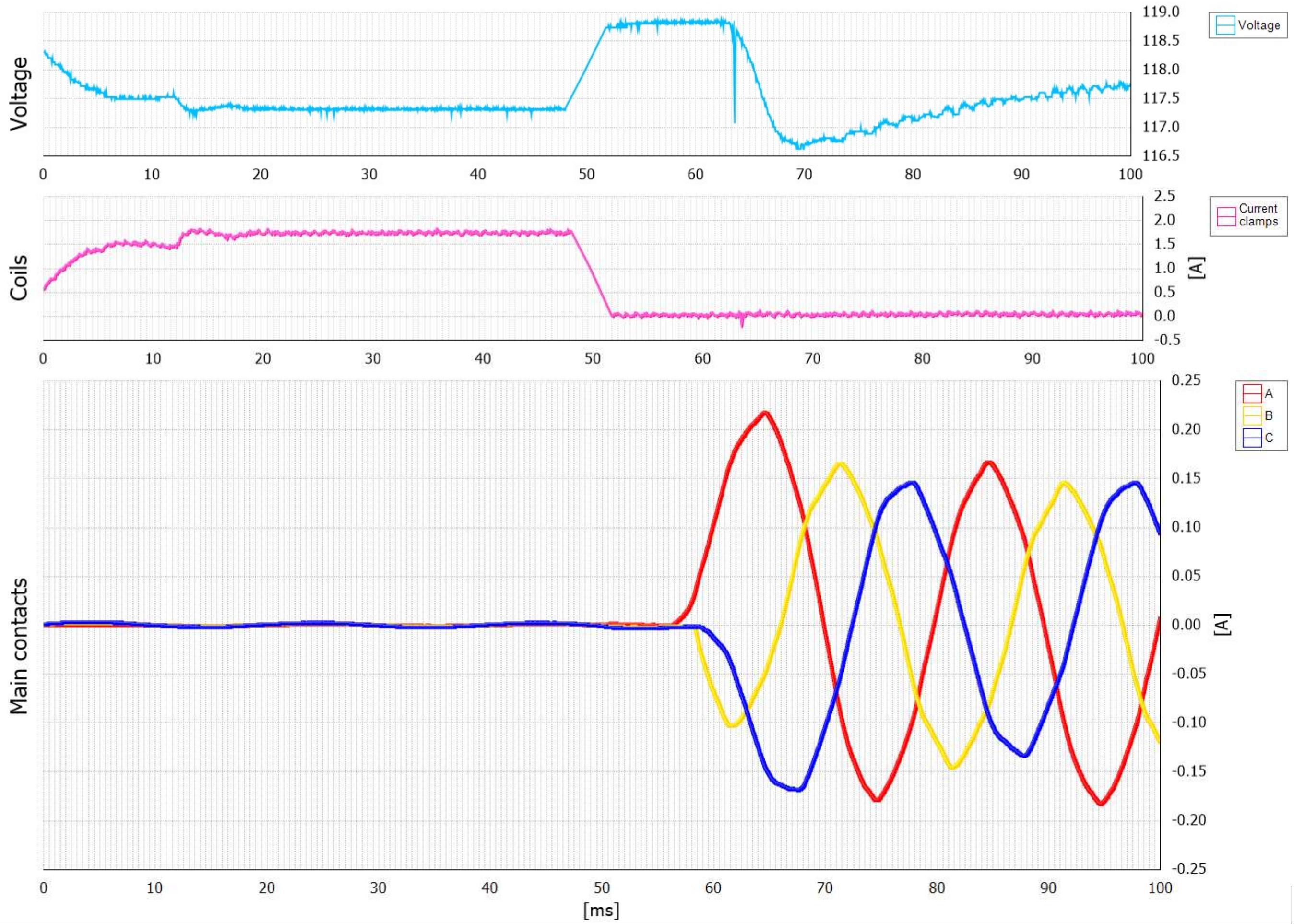
Company and location	
Company	
Address	
Country	
Department	
Station name	KAIKOHE
Contact person	-
Phone No.	-
Fax No.	-
E-mail	-
Enviroment conditions	
Temperature	
Humidity	
Pressure	
Test object data	
Test object	Switcher
Test object type	GHA
Test object serial number	
Test device	CATP
Manufacturer	
Model	
Test object ID	CB13612
Cubical	
Field	
Voltage level	
Rated current	
Rated short circuit current	
Rated breaking capacity	
Number of operations	
Operating mechanism	
Control type	Single pole control
Breaks per phase	1

Main contacts timing					
Designation	**Min**	**Max**	**C1**	**Unit**	**Pass/Check**
Close time(t_c)	0	0	59.35	[ms]	-
Close time sync(dt_c)	0	0	2.05	[ms]	-

Coil current - specific values					
Name	**Min**	**Max**	**C1**	**Unit**	**Pass/Check**
Imax	0	0	1.82	[A]	-
Pick-up time	0	0	5.3	[ms]	-
Ipmax	0	0	1.41	[A]	-
Latch	0	0	4.8	[ms]	-
Aux	0	0	48.15	[ms]	-
De-energized coil	0	0	51.55	[ms]	-

Analog channels					
Name	**Min**	**Max**	**C1**	**Unit**	**Pass/Check**
Umin	0	0	116.63	[V]	-
Init. Voltage	0	0	118.3	[V]	-

Timing test	C1 (Close test)		
General parameters		**Testing device settings**	
Execution date/Time	7/11/2023 / 12:11 PM	Device model / Serial-no	/
Measuring time	350 ms	Trigger source	DC Current
Resolution	0.05 ms	Trigger treshold	0.6
Command pulse	10	Trigger type	Rising edge
Frequency	0 Hz	Trigger waiting time	∞



Designation	Min	Max	Value	Unit	Pass/Check
Close time(tc)	0	0	59.35	[ms]	-
Close time sync(dtc)	0	0	2.05	[ms]	-

Closing time					
Designation	**Min**	**Max**	**Value**	**Unit**	**Pass/Check**
Close time - A	0	0	57.3	[ms]	-
Close time - B	0	0	58.6	[ms]	-
Close time - C	0	0	59.35	[ms]	-

Analog channels					
Designation	**Min**	**Max**	**Value**	**Unit**	**Pass/Check**
Umin	0	0	116.63	[V]	-
Init. Voltage	0	0	118.3	[V]	-

Test report

CB163612 T3 Incomer Open

Supervisor ______________________

Operator . ______________________

Note

-

____
Signature

General data

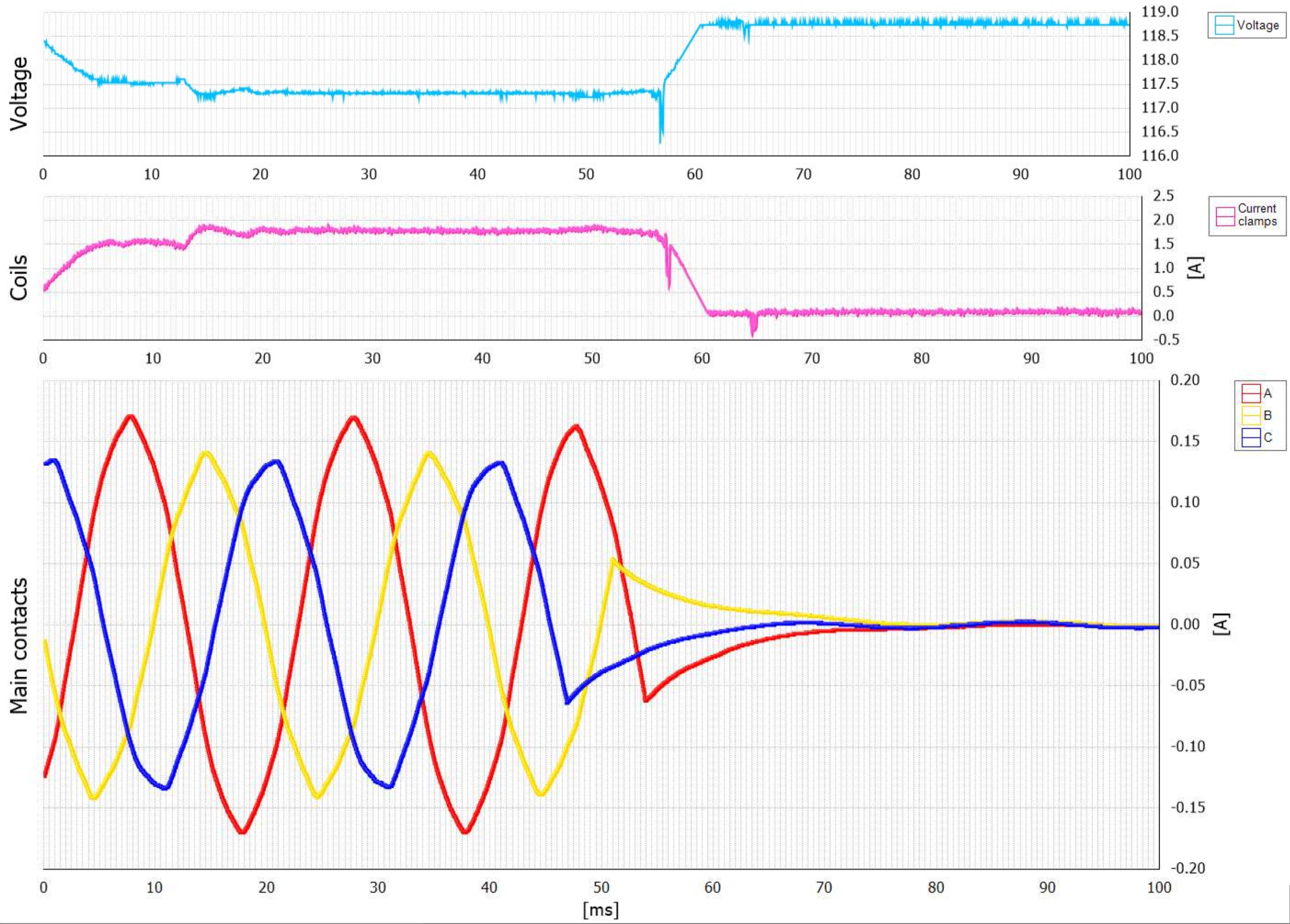
Company and location	
Company	
Address	
Country	
Department	
Station name	KAIKOHE
Contact person	-
Phone No.	-
Fax No.	-
E-mail	-
Enviroment conditions	
Temperature	
Humidity	
Pressure	
Test object data	
Test object	-
Test object type	GHA
Test object serial number	
Test device	CATP
Manufacturer	
Model	
Test object ID	CB163612
Cubical	
Field	
Voltage level	
Rated current	
Rated short circuit current	
Rated breaking capacity	
Number of operations	
Operating mechanism	
Control type	Single pole control
Breaks per phase	1

Main contacts timing					
Designation	**Min**	**Max**	**O1**	**Unit**	**Pass/Check**
Open time(t_o)	0	0	53.9	[ms]	-
Open time sync(dt_o)	0	0	7.05	[ms]	-

Coil current - specific values					
Name	**Min**	**Max**	**O1**	**Unit**	**Pass/Check**
Imax	0	0	1.9	[A]	-
Pick-up time	0	0	5.15	[ms]	-
Ipmax	0	0	1.53	[A]	-
Aux	0	0	55.7	[ms]	-
De-energized coil	0	0	60.5	[ms]	-

Analog channels					
Name	**Min**	**Max**	**O1**	**Unit**	**Pass/Check**
Umin	0	0	116.45	[V]	-
Init. Voltage	0	0	118.4	[V]	-

Timing test	O1 (Open test)		
General parameters		**Testing device settings**	
Execution date/Time	7/11/2023 / 11:24 AM	Device model / Serial-no	/
Measuring time	350 ms	Trigger source	DC Current
Resolution	0.05 ms	Trigger treshold	0.6 A
Command pulse	80	Trigger type	Rising edge
Frequency	50 Hz	Trigger waiting time	∞



Designation	Min	Max	Value	Unit	Pass/Check
Opening time - A	0	0	53.9	[ms]	-
Opening time - B	0	0	50.95	[ms]	-
Opening time - C	0	0	46.85	[ms]	-

Coil currents					
Coil	**Min**	**Max**	**Value**	**Unit**	**Pass/Check**
Imax	0	0	1.9	[A]	-
Pick-up time	0	0	5.15	[ms]	-
Ipmax	0	0	1.53	[A]	-
Aux	0	0	55.7	[ms]	-
De-energized coil	0	0	60.5	[ms]	-

Analog channels					
Designation	**Min**	**Max**	**Value**	**Unit**	**Pass/Check**

Analog channels					
Designation	**Min**	**Max**	**Value**	**Unit**	**Pass/Check**
Umin	0	0	116.45	[V]	-
Init. Voltage	0	0	118.4	[V]	-

Northpower

Monday, July 10, 2023

P12 - Circuit Breaker Maintenance

Substation
Kaikohe

Voltage
33 kV

Job Number
TC3041558

CB Number
CB163612 T3 Incomer

Inspector
Ian Reed

Date of Inspection
Tuesday, July 11, 2023

This form details the data capture requirements for the CB Maintenance/Service work. Typical time between service intervals is 4 yearly or as required.
The form is general and to be used for all types of circuit breakers. For the specific work instructions please refer to relevant documentation for the specific type of CB.

Test Equipment Data Capture

	Manufacturer	Model	Serial	Calibration Date
Unit 1	DV Power	CB Analyzer	21U380P	25/05/24
Unit 2				
Unit 3				
Unit 4				

Visual and Mechanical Checks

	No Defect	N/A	Priority	Defect	Fixed on site	Refer to Detail
Check CB Labelling	✓					
Alarms and Relay Flags Reset						

	No Defect	N/A	Priority	Defect	Fixed on site	Refer to Detail
Check Earth Contacts						
Check Earth Bonds						
Test CB Operation & Indication						
Droppers and Connection to OH Bus						

Comments + Defects

Battery Inspection and Defects

	1	2	3	4
R - Circuit Site				
R - Bus Side				
Y - Circuit Side				
Y - Bus Side				
B - Circuit Side				
B - Bus Side				

Comments + Defects

Upload Pictures of Defects

Withdrawable Breakers

	No Defect	N/A	Defect	Fixed on site	Priority	Refer to detail
Discharge any stored energy in springs						
Rack down CB, check operation of mechanism and remove from panel						
Check interior of panel for signs of discharge (shutters & operating mechanisms), Clean as required.						

	No Defect	N/A	Defect	Fixed on site	Priority	Refer to detail
Inspect CB Truck for any signs of damage (e.g. discharge on top of tank)						
Check Bushings for Damage and Clean						
Check Isolation Contacts on Bushings						
Check Contact Assembly for Loose Connection with Bushings						
Check Contact Assemble for Tightness & Signs of Damage						
Check and Clean Auxiliary Contacts						
Clean and Lubricate Mechanism						
Check Interlocks						
Raise & Lower Mechanism						
Check Explosion Vents (OCB)						

Climatic Conditions

	Value
Ambient Temperature (C)	
Humidity (%)	

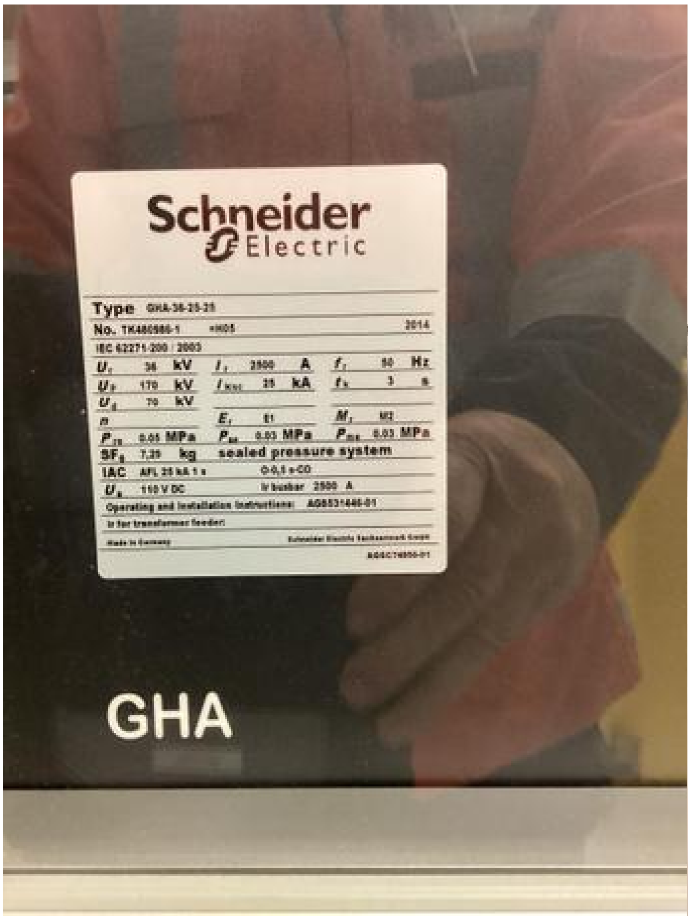
Typical values for Vacuum and SF6 CBs are between 30 and 50 microhms, the measured value shall not

exceed 100 microhms.
For oil CBs the values are typically between 50 and 120 microhms, the measured value shall not exceed 200 microhms.

Alarm/Indication Checks

	Local	Remote	SCADA
Open			
Close			
Isolate			
Spring Discharged			
CB on Manual			
CB on Local			
Low Gas Pressure			
Gas Pressure Lockout			
Spring Motor Fault			

Upload Pictures of Defects



CB163612 T3 Incomer Close.pdf

CB163612 T3 Incomer Open.pdf

Completion Tasks

CB Returned to Normal State	
Site Cleaned	
All Panels/Cabinets Closed	
Permit Returned and CB Functional	

Signature of Inspector

From: Rob Ramsey
Sent on: 10 November 2025 10:21:16
To: Claire Picking
Subject: Kaikohe CB163612
Attachments: OneDrive_2025-11-09 (1).zip (2.69 MB), OneDrive_2025-11-09 (2).zip (550.24 KB), 2020-12 - P08E - Kaikohe 33kV Substation Check.pdf (314.1 KB), 2024-10 - P08 - Kaikohe 33kV.pdf (154.75 KB)

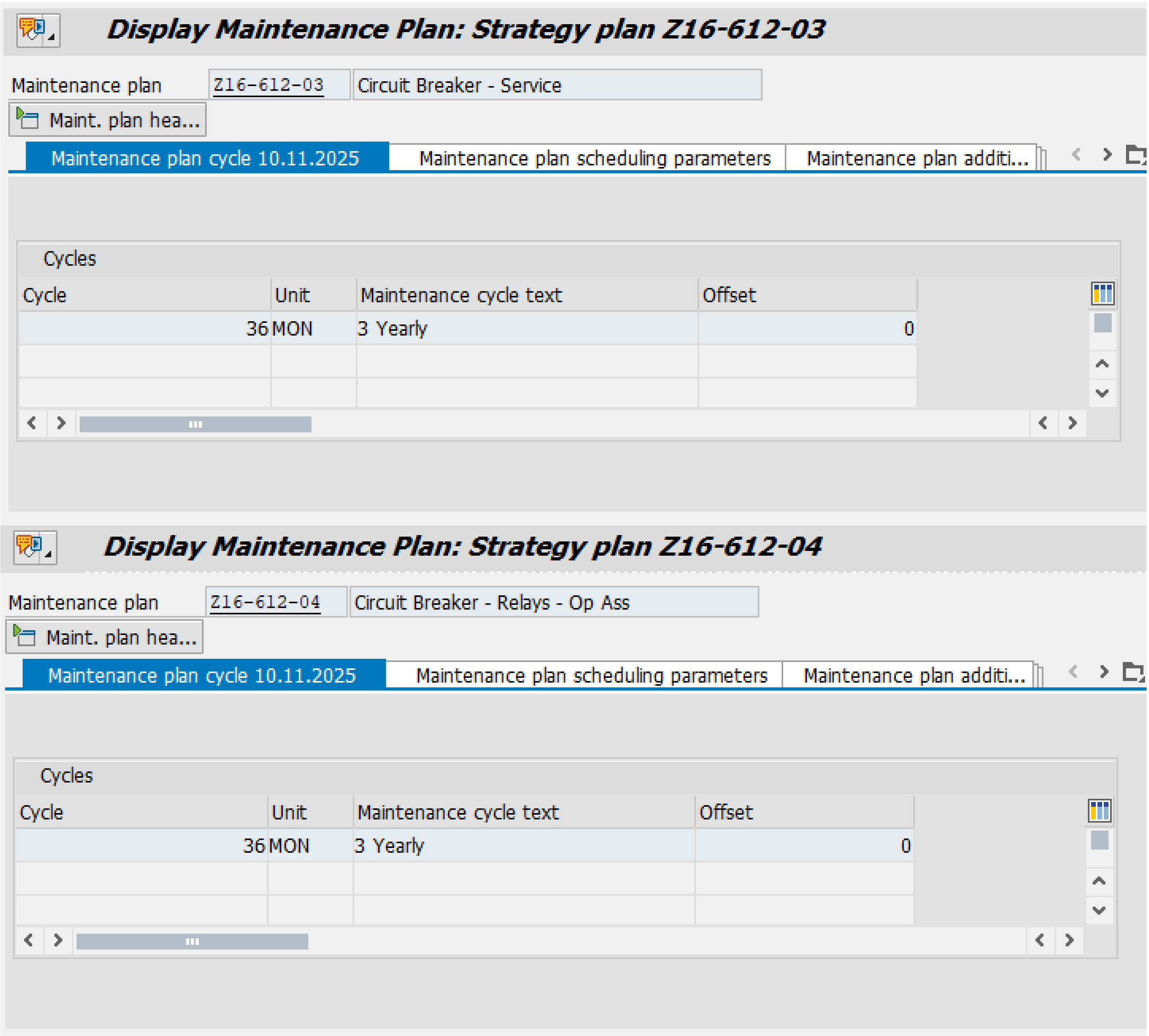
Hi Claire

Info as requested

Maintenance Strategy

-
The standard Maintenance strategy for our CBs is 4 yearly – this aligns with the protection testing strategy. As Kaikohe is a critical site the strategy / frequency for the 33kV panel maintenance was set up to a 3 yearly strategy. Last Maintenance was carried out in June/July 2023 P16 report attached for CB and P17 for protection.

CB163612 –



These are low Maintenance SF6 units. The Maintenance requirements for the breakers themselves involves visual checks and an operational timing check carried out during the Protection relay testing.

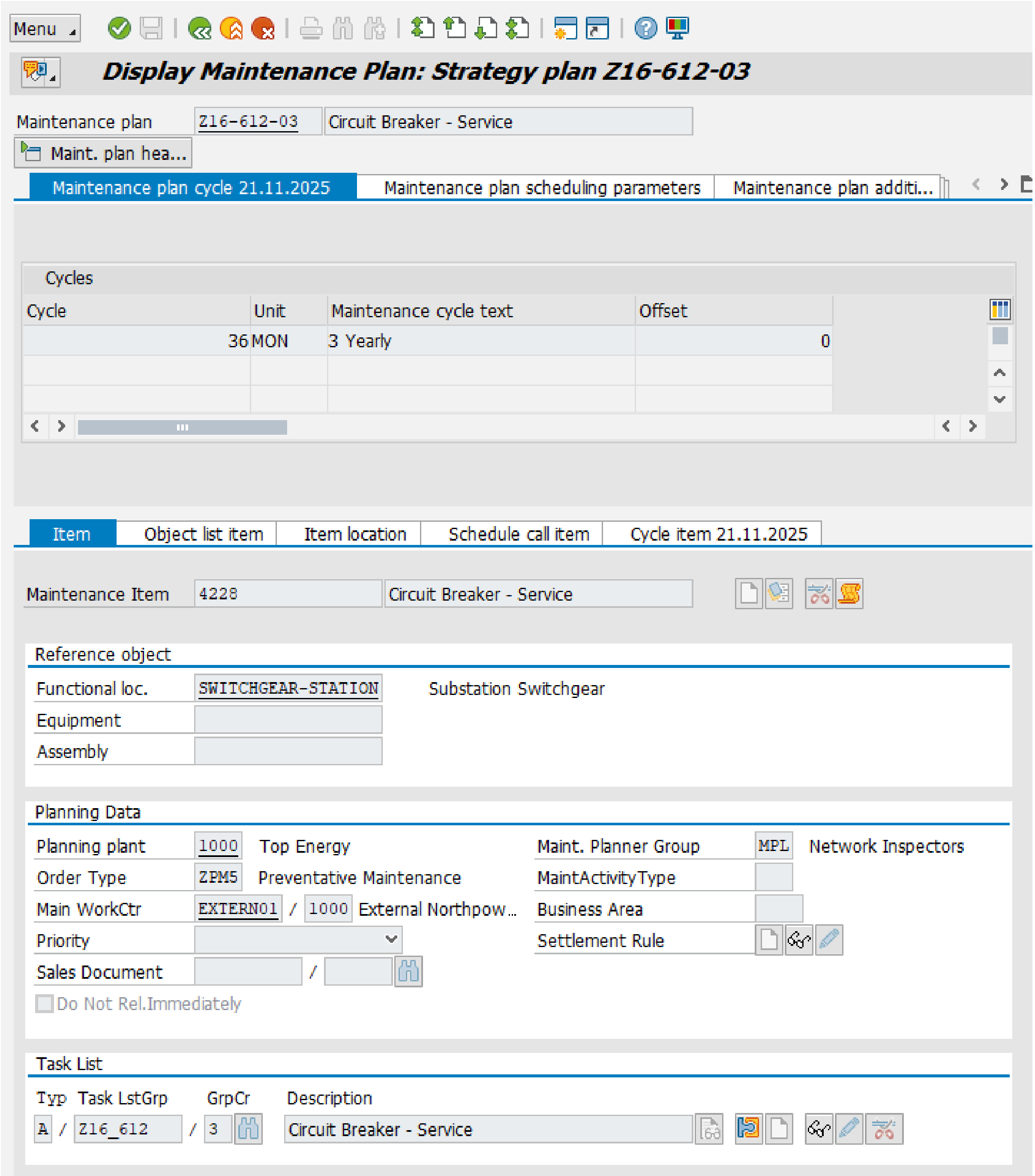
Substation Inspections

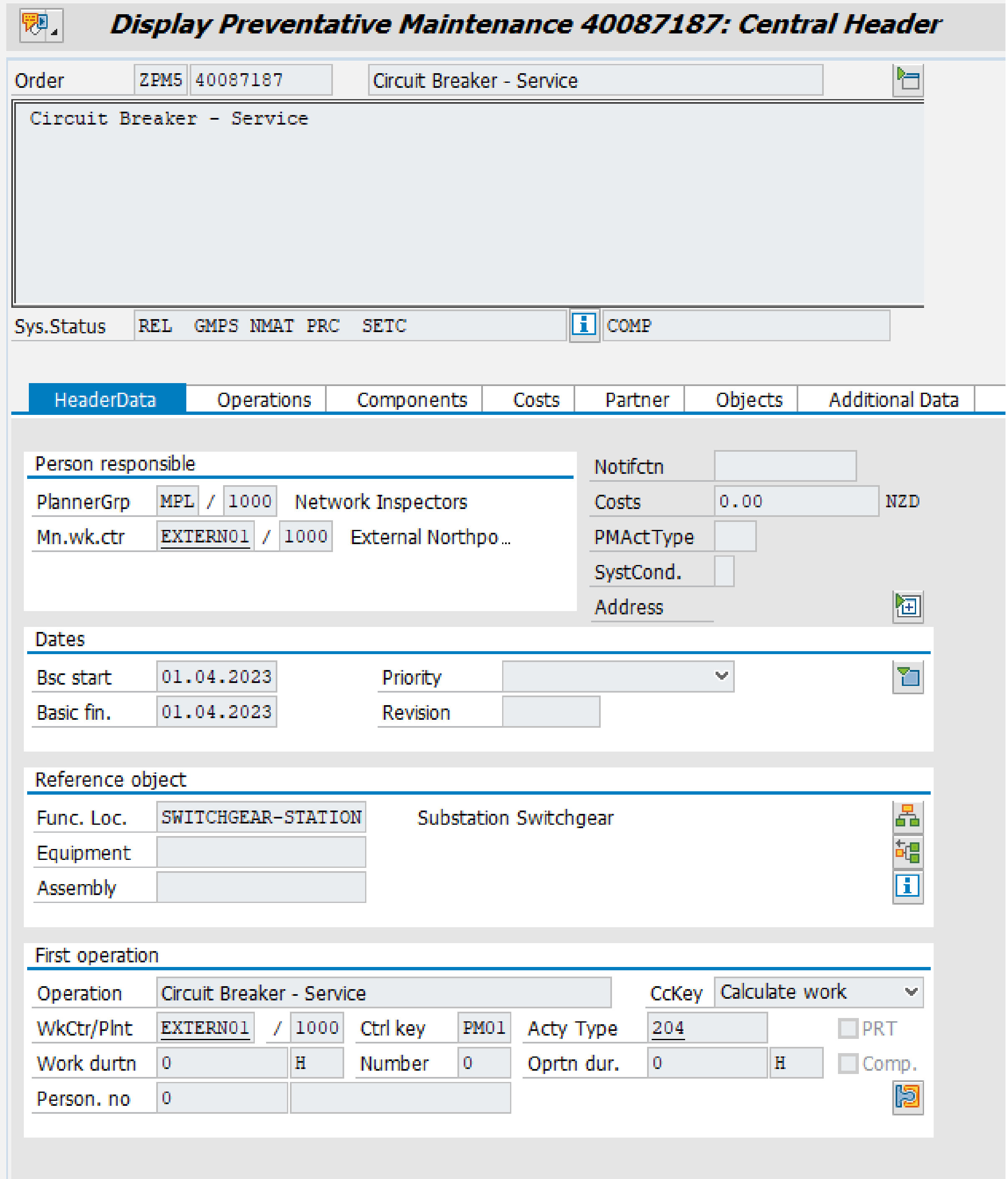
-
These are carried out on a monthly basis. Two supplied – most recent Oct 25 other Dec 2017 – have others if required. These involve a visual check of the Buildings and equipment in them. This includes pre-building entry checks [site / sound / smell etc] , switchgear visuals / gas pressure gauge / alarm checks. I understand very basic TEV check may also be included but reporting on this may be by exception.

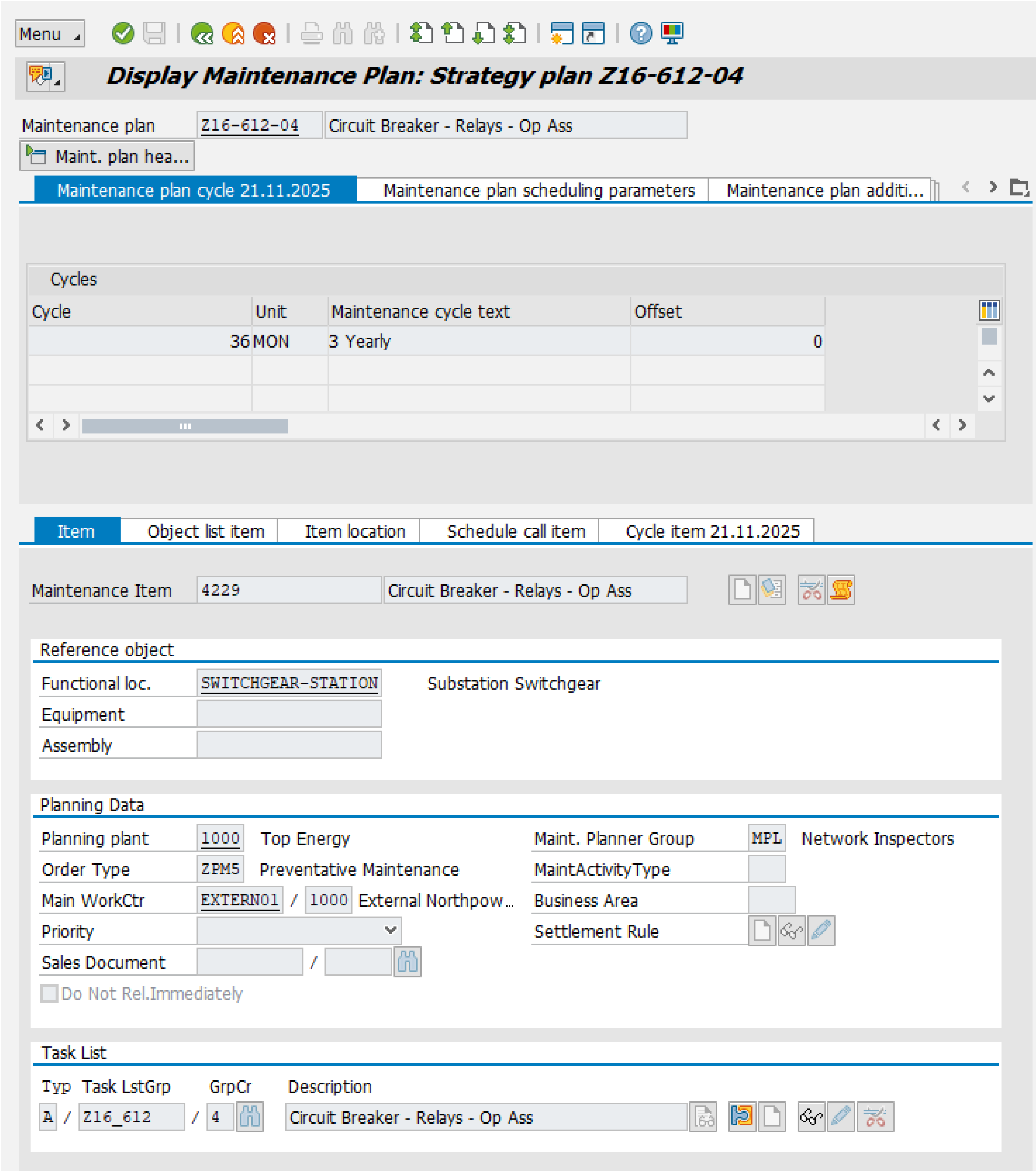
Hope this info helps

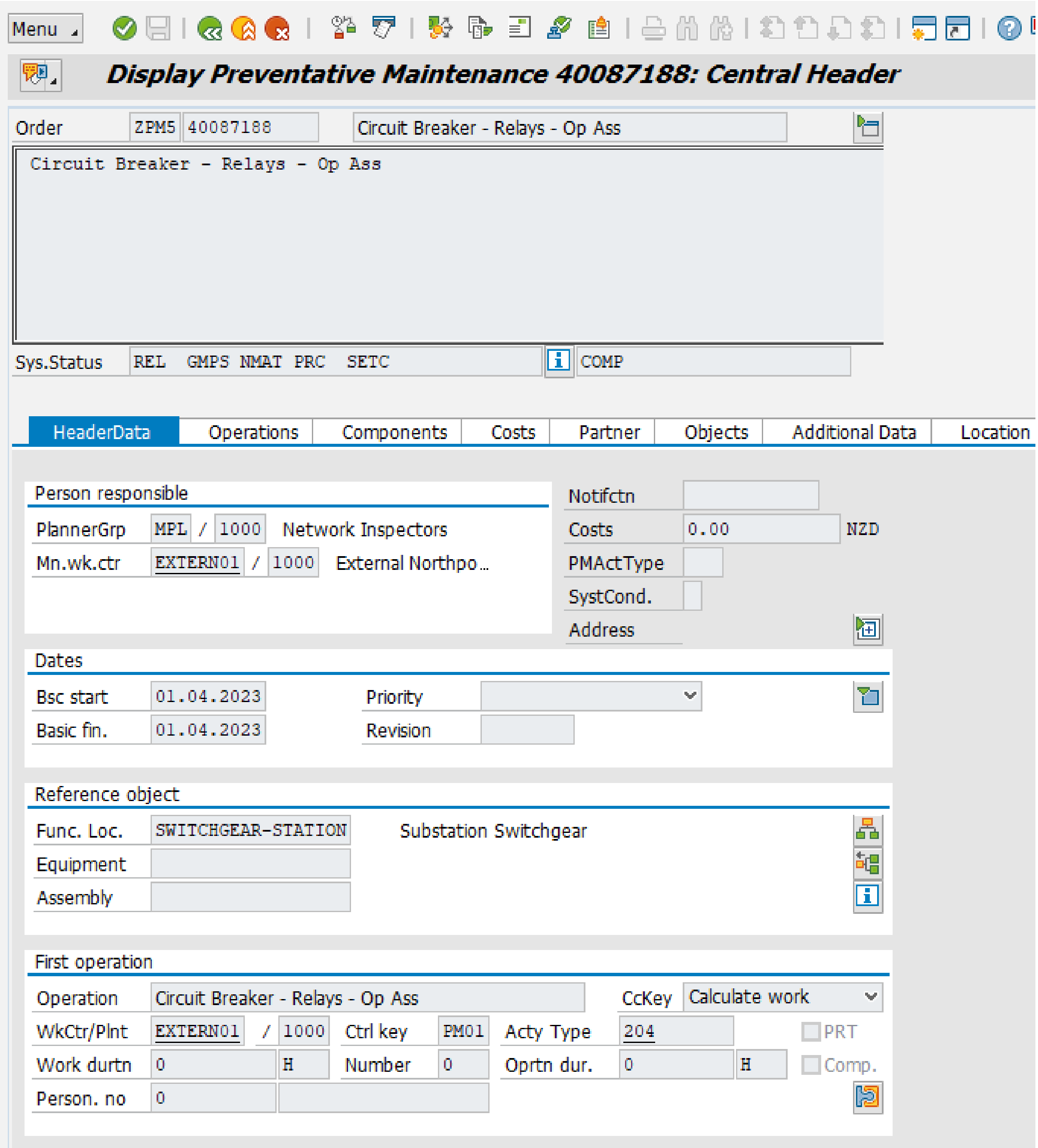
Cheers

R


Menu
Display Maintenance Plan: Strategy plan Z16-612-03
Maintenance plan Z16-612-03 Circuit Breaker - Service
Maint. plan hea...
Maintenance plan cycle 21.11.2025
Maintenance plan scheduling parameters
Maintenance plan additi...
Cycles
Cycle
Unit
Maintenance cycle text
Offset
36 MON 3 Yearly 0
Item
Object list item
Item location
Schedule call item
Cycle item 21.11.2025
Maintenance Item 4228 Circuit Breaker - Service
Reference object
Functional loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
Planning Data
Planning plant 1000 Top Energy
Order Type ZPM5 Preventative Maintenance
Main WorkCtr EXTERN01 / 1000 External Northpow...
Priority
Sales Document /
Do Not Rel.Immediately
Maint. Planner Group MPL Network Inspectors
MaintActivityType
Business Area
Settlement Rule
Task List
Typ Task LstGrp GrpCr Description
A / Z16_612 / 3 Circuit Breaker - Service


Display Preventative Maintenance 40087187: Central Header
Order ZPM5 40087187 Circuit Breaker - Service
Circuit Breaker - Service
Sys.Status REL GMPS NMAT PRC SETC
COMP
HeaderData
Operations
Components
Costs
Partner
Objects
Additional Data
Person responsible
PlannerGrp MPL / 1000 Network Inspectors
Mn.wk.ctr EXTERN01 / 1000 External Northpo...
Notifctn
Costs 0.00 NZD
PMActType
SystCond.
Address
Dates
Bsc start 01.04.2023
Basic fin. 01.04.2023
Priority
Revision
Reference object
Func. Loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
First operation
Operation Circuit Breaker - Service
CcKey Calculate work
WkCtr/Plnt EXTERN01 / 1000
Ctrl key PM01
Acty Type 204
PRT
Work durtn 0 H
Number 0
Oprtn dur. 0 H
Comp.
Person. no 0


Menu
Display Maintenance Plan: Strategy plan Z16-612-04
Maintenance plan Z16-612-04 Circuit Breaker - Relays - Op Ass
Maint. plan hea...
Maintenance plan cycle 21.11.2025
Maintenance plan scheduling parameters
Maintenance plan additi...
Cycles
Cycle
Unit
Maintenance cycle text
Offset
36 MON 3 Yearly 0
Item
Object list item
Item location
Schedule call item
Cycle item 21.11.2025
Maintenance Item 4229 Circuit Breaker - Relays - Op Ass
Reference object
Functional loc. SWITCHGEAR-STATION Substation Switchgear
Equipment
Assembly
Planning Data
Planning plant 1000 Top Energy
Maint. Planner Group MPL Network Inspectors
Order Type ZPM5 Preventative Maintenance
MaintActivityType
Main WorkCtr EXTERN01 / 1000 External Northpow...
Business Area
Priority
Settlement Rule
Sales Document /
Do Not Rel.Immediately
Task List
Typ Task LstGrp GrpCr Description
A / Z16_612 / 4 Circuit Breaker - Relays - Op Ass



Menu
Display Preventative Maintenance 40087188: Central Header
Order
ZPM5
40087188
Circuit Breaker - Relays - Op Ass
Circuit Breaker - Relays - Op Ass
Sys.Status
REL GMPS NMAT PRC SETC
COMP
HeaderData
Operations
Components
Costs
Partner
Objects
Additional Data
Location
Person responsible
PlannerGrp
MPL / 1000
Network Inspectors
Mn.wk.ctr
EXTERN01 / 1000
External Northpo...
Notifctn
Costs
0.00
NZD
PMActType
SystCond.
Address
Dates
Bsc start
01.04.2023
Basic fin.
01.04.2023
Priority
Revision
Reference object
Func. Loc.
SWITCHGEAR-STATION
Substation Switchgear
Equipment
Assembly
First operation
Operation
Circuit Breaker - Relays - Op Ass
CcKey
Calculate work
WkCtr/Plnt
EXTERN01 / 1000
Ctrl key
PM01
Acty Type
204
PRT
Work durtn
0
H
Number
0
Oprtn dur.
0
H
Comp.
Person. no
0