

# Next-Generation Zone Substations: Safe, Reliable, and Modular

Stijo Stephen – APEX 2025



**Electra**

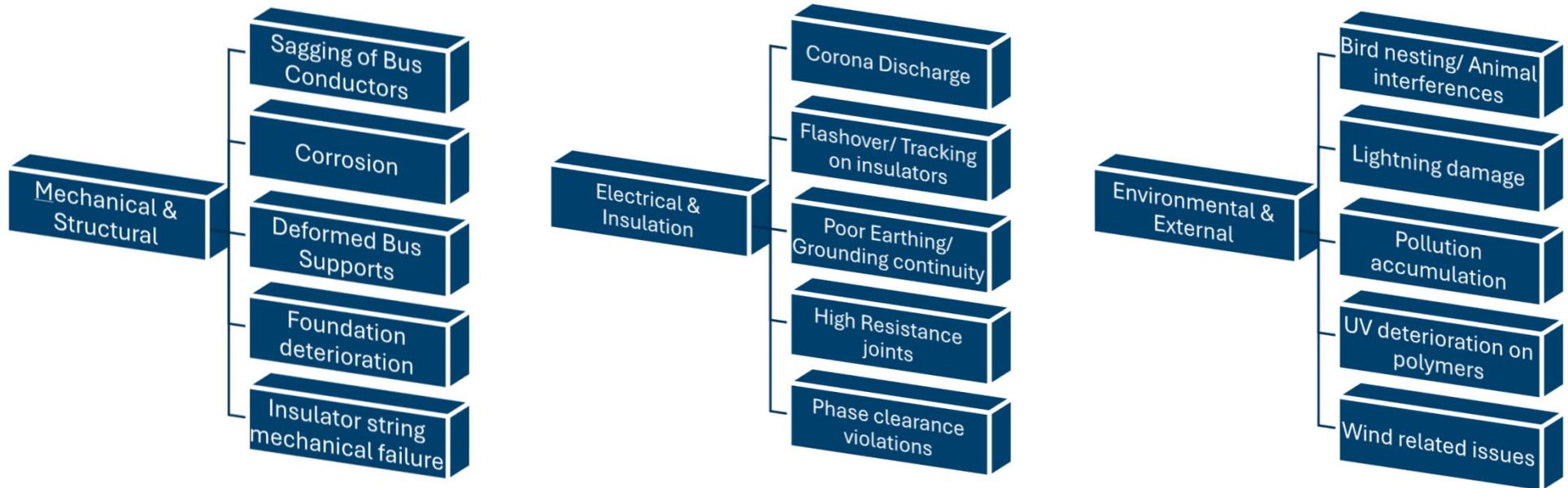
# Substation -33kV Overhead Structure



- Conductors
- Insulators
- Surge arresters
- Overhead Bus structure
- Circuit breaker
- Local Service transformer
- Current/Voltage Transformers



# Challenges of Outdoor Overhead Bus



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# Substation -33kV Indoor Switchgear



- Enhanced Safety & Reliability
- Minimal Maintenance Requirements
- Reduced Environmental exposure
- Greater Operational Flexibility
- Built in Arc flash containment



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# Challenges of Indoor 33 kV Switchgear



Higher Initial Cost

Building requirements

Heat Dissipation

Expandability issues

Access and Lifting constraints

Water Ingress/ Moisture risk

Fault repair complexity



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# Indoor Circuit Breakers failure



Shannon Sub Switchroom

2021-09-21 02:33:20



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# Background & Vision



- Growing demand for reliable and sustainable power supply
- Ageing 33 kV overhead infrastructure nearing end of life
- Vision: Improve safety, reliability, and operational efficiency while reducing maintenance and environmental exposure.
- Strategic objective: standardize substation layouts using modular, ground-mounted, factory-assembled solutions
- Set up Steering committee and appointed a consultant



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# Technology Selection



- Comprehensive evaluation of modular solutions
- Considered technical performance, lifecycle cost, and environmental impact
- Replacement of conventional overhead systems with ground-mounted modular solutions
- S&C Vista Green Switchgear selected as preferred option



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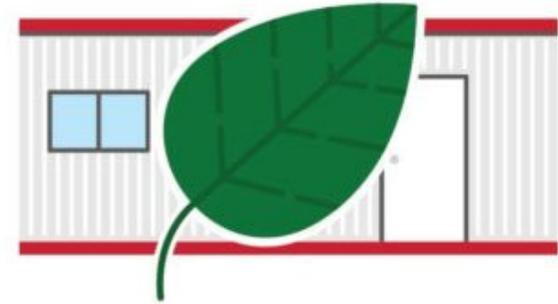
# Benefits of Modular Approach



**It's Faster**



**It's More Cost Effective**



**It's Greener**



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# Why the Vista unit?



Withstands harsh environments



Fully submersible, sealed, and protected



Reduces maintenance costs



Improves reliability over oil-insulated switchgear



Certified arc-resistant\*



Simple operation



No fuse handling

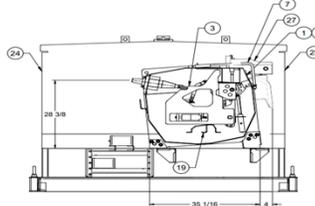
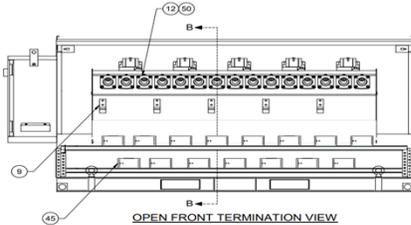
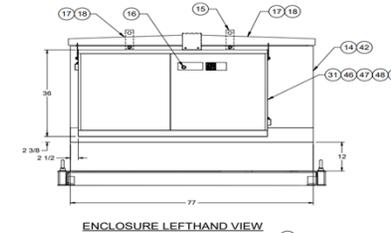
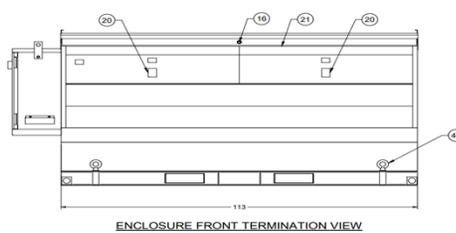
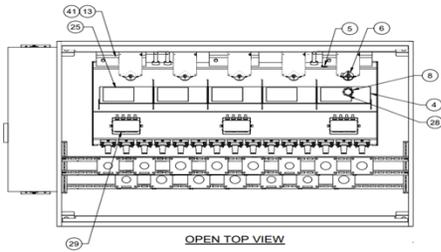


Green insulation technology\*\*

# Dimensional Drawing of Vista Unit



THIS VISTA UDS IS EQUIPPED WITH FAULT-INTERRUPTERS THAT ARE THREE-POLE GROUP OPERATED FOR MANUAL SWITCHING.



**FEATURES IN THIS ASSEMBLY**

1. NAMEPLATE
3. 900-AMPERE THREE-POLE MANUAL FAULT-INTERRUPTER WITH THREE-POSITION (CLOSED-OPEN-GROUND) DISCONNECT WINDOW FOR VIEWING OPEN GAP AND GROUNDED POSITION OF LOAD-INTERRUPTER SWITCH OR FAULT INTERRUPTER
4. GAS FILL PORT
5. OPERATING MECHANISM
6. MANUAL OPERATING HANDLE
8. PRESSURE GAUGE
9. TWO-HOLE GROUND PAD
10. SUBMERSIBLE SF6-INSULATED TANK
12. 900-AMPERE BUSHINGS FOR FAULT-INTERRUPTER
13. EXTERNAL TRIP
14. 1/4-GAUGE PAD-MOUNTED ENCLOSURE
15. LIFTING TABS FOR SINGLE POINT LIFT
16. PENTAHEAD BOLT LOCKING MECHANISM ACCOMMODATES PADLOCK WITH 3/75" DIAMETER SHACKLE
17. HINGED LIFT LIP ROOF
18. ROOF RETAINER TO HOLD ROOF IN POSITION
19. COPPER BUS
20. WARNING SIGN
21. REMOVABLE PANEL
23. OPERATION COMPARTMENT LABEL
24. TERMINATION COMPARTMENT LABEL
25. VOLTAGE INDICATION WITH TEST FEATURE
27. MOTOR OPERATOR
28. REMOTE PRESSURE INDICATOR
29. VISTA JUNCTION BOX
31. LOW-VOLTAGE ENCLOSURE

**OPTIONAL FEATURES IN THIS ASSEMBLY**

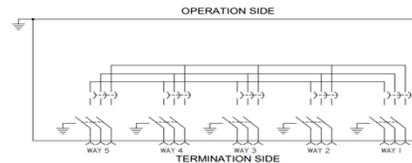
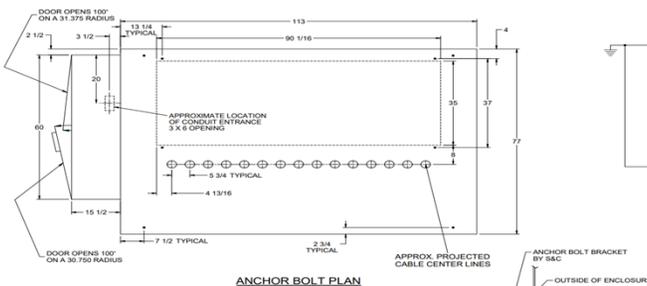
- A1 MOTOR OPERATOR PACKAGE, WAY 1
- A2 MOTOR OPERATOR PACKAGE, WAY 2
- A3 MOTOR OPERATOR PACKAGE, WAY 3
- A4 MOTOR OPERATOR PACKAGE, WAY 4
- A5 MOTOR OPERATOR PACKAGE, WAY 5
- C21 AUXILIARY CONTACTS FAULT INTERRUPTER SWITCHES WIRING ROUTED ON TANK FOR FUTURE CUSTOMER CONNECTION
- E STAINLESS STEEL LOW VOLTAGE ENCLOSURE
- F4 MOUNTING PROVISIONS FOR A FAULT INDICATOR FOR EACH FAULT-INTERRUPTER SWITCH WITH VIEWING WINDOW
- L2 POTENTIAL INDICATION WITH TEST FEATURE, WITH PROVISIONS FOR LOW-VOLTAGE PHASING
- L71 INTERNATIONAL CRATING
- D1 TWO-HOLE GROUND PAD, ONE PER WAY
- P16 PAD-MOUNTED STYLE, FIVE OR SIX-WAY UNIT, STAINLESS-STEEL OUTER ENCLOSURE, S&C OLIVE GREEN (MUNSELL 7G3.29/1.5) FINISH
- O1 900-AMPERE FAULT-INTERRUPTER ON WAY 1
- O2 900-AMPERE FAULT-INTERRUPTER ON WAY 2
- O3 900-AMPERE FAULT-INTERRUPTER ON WAY 3
- O4 900-AMPERE FAULT-INTERRUPTER ON WAY 4
- O5 900-AMPERE FAULT-INTERRUPTER ON WAY 5
- R11 REMOTE LOW-PRESSURE ALARM, WITH WIRES ROUTED TO LOW-VOLTAGE ENCLOSURE/COMPARTMENT FOR FUTURE CUSTOMER CONNECTIONS
- R43 EXTERNAL TRIP PROVISIONS
- W13 1/2-INCH STAINLESS-STEEL BASE SPACER WITH TANK SUPPORT
- Z5 COPPER BUS
- Z6 CONTROL UNIT FOR USE WITH RTU BY OTHERS, EXTERNAL CONTROL POWER USER-SUPPLIED

**SPECIAL FEATURES**

40. 50 HERTZ SYSTEM FREQUENCY
41. EXTERNAL TRIP PROVISIONS, FOR USE WITH 36 VDC
42. 113" WIDE X 77" DEEP STAINLESS STEEL HIGH VOLTAGE ENCLOSURE WITH SINGLE POINT LIFT
43. 170KV BIL RATING
44. SKID WITH 4-LIFTING POINTS TO LIFT THE ENCLOSURE BASE SPACER AND SKID
45. EXTERNAL TRIP CURRENT TRANSFORMERS, MODEL 113-601 RATIO 600:5, CLASS C100, WAYS 1, 2, 3, 4 & 5
46. 40" WIDE X 15.5" DEEP STAINLESS STEEL LOW VOLTAGE ENCLOSURE
47. SHORTING TERMINAL BLOCKS FOR WAYS(S) 1, 2, 3, 4 & 5
48. MOTOR OPERATOR INDICATION AND REMOTE OPERATION WIRE TO A TERMINAL BLOCK FOR CUSTOMER CONNECTION
49. CUSTOMER TO SUPPLY 240VAC CONTROL POWER
50. IEC TYPE C BUSHINGS

NOTE THE FOLLOWING DEVICES WIRED PER:  
OCDR-20043 VISTA REMOTE SUPERVISORY WIRING DIAGRAM

		RATINGS	
STANDARD		IEC	ANSI
HERTZ		50/60	50/60
KV, MAX DESIGN		38	38
KV, BIL		170	170
MAIN BUS	CONTINUOUS	1200	1200
	LOAD DROPPING	900	900
FAULT INTERRUPTER	FAULT CLOSING	25,000	25,000
	DUTY-CYCLE	25,000	25,000
	THREE-TIME	25,000	25,000
	SYMMETRICAL	25,000	25,000
SHORT-CIRCUIT		25,000	25,000



REVISIONS			
REV	REVISION	DATE	BY
000	CAE36473	22-MAR-2024	EY

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PROJECT NO.	DATE	REV	DESCRIPTION
000	22-MAR-2024	01	ISSUE FOR CONSTRUCTION

**S&C ELECTRIC COMPANY**  
Excellence Through Innovation

PROJECT: S&C REMOTE SUPERVISORY VISTA UNDERGROUND DISTRIBUTION SWITCHGEAR MODEL 505

DATE: 22-MAR-2024

SCALE: INCHES

PROJECT LOCATION: VISTA

SHEET 1 OF 1  
DIMENSIONAL DRAWING  
865054-S112-DIM

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# Pilot Site: Foxton Zone Substation



- Target completion: December 2026
- Will serve as a reference model for future rollouts
- Two additional substations to follow in next 2-3 years.



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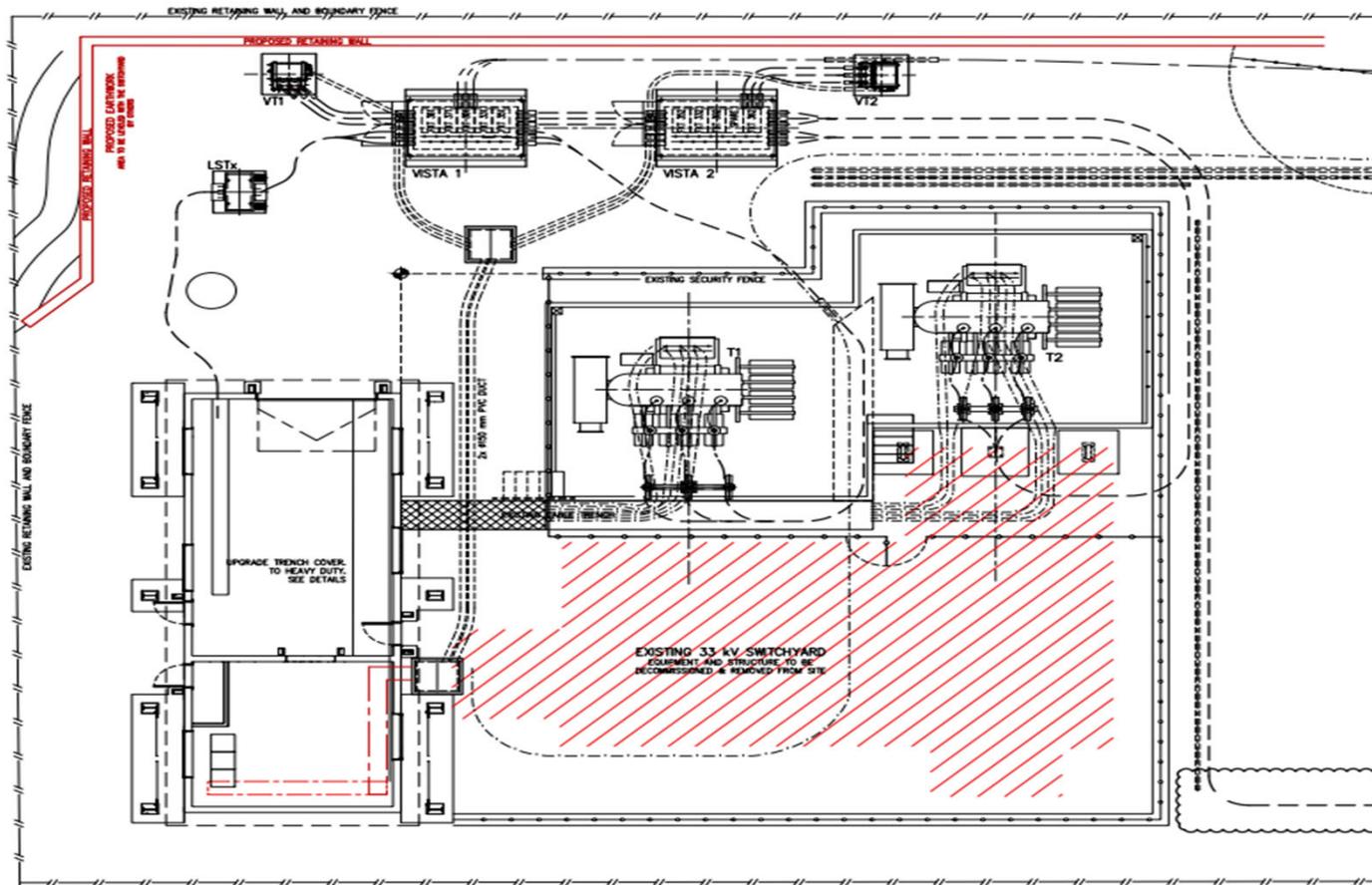


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# Foxton ZS Proposed Layout



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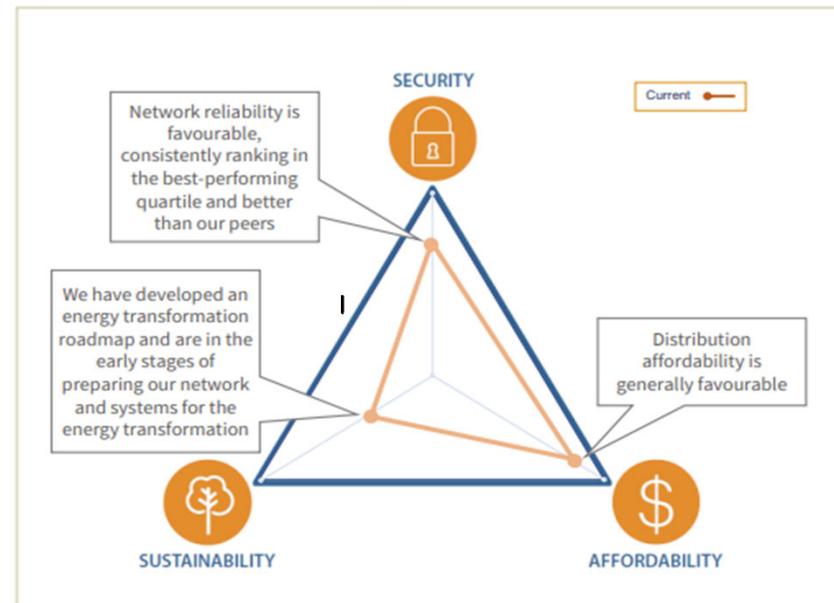
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# Sustainability Advantage



- Hermetically sealed CO<sub>2</sub> option
- 97% reduction in global warming potential vs. SF<sub>6</sub>
- Lowest total carbon footprint
- Supports Electra's environmental and sustainability goals.

Figure 11: Electra's current energy trilemma balance



# Future Roadmap



- Post-Foxton rollouts to additional substations
- Continuous improvement through operational feedback
- Installation of modular concept to secondary side



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# Conclusion: A New Benchmark



- Modern, modular, and sustainable solution for zone substations
- Strengthening network reliability and safety
- This modular approach sets a new benchmark in electricity distribution
- Enabling staged upgrades with minimal supply interruptions, improving resilience to technical and environmental challenges, and aligning safety with sustainability goals.
- This will serve as a reference model for future upgrades across New Zealand's electricity network.



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THANK YOU

