Request for Tender

Atiu Power Upgrade Project

Supply and Delivery of High-Voltage Electrical Equipment

Reference No.: OPM/REDD-01/2015
Date of Release: 14 March 2015

Office of the Prime Minister

All queries regarding this Request for Tender should be directed to:

Project Engineer

ngateina.rani@cookislands.gov.ck

TENDER CLOSING TIME: 1:00pm (CI Time)

Monday 6th April 2015

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Document Control

Document Revision

Rev No.	Prepared By	Office	Date
1	Ngateina Rani (Project Engineer)	Renewable Energy Development Division, Office of the Prime Minister	Feb 2015

Document Acceptance

Action	Name	Date
Prepared by	Ngateina Rani (Project Engineer) Office of the Prime Minister CIGov	Feb 2015
Technical Review by	Terekino Vaireka Electrician/Electrical Engineer/Former National PEEP2 Coordinator and EE Expert	Feb 2015
Finance Review by	Teina Frank Office of the Prime Minister Cook Islands Government	Feb 2015
Legal Review by	Crown Law, Cook Islands Government	Feb/Mar 2015
Approved by	Elizabeth Wright-Koteka Office of the Prime Minister Cook Islands Government	Mar 2015
On Behalf of	Renewable Energy Development Division Office of the Prime Minister Cook Islands Government	

Glossary and Definitions

TERM	EXPLANATION
APU	Atiu Power Upgrade
CIF	Cost, Insurance and Freight
CIGov	Cook Islands Government
OPM	Office of the Prime Minister
HV	High Voltage
LV	Low Voltage
CIGFPPM	Cook Islands Government Financial Policies and Procedures Manual
MFEM	Ministry of Finance and Economic Management
NTT	Notice to Tenderers
OPM	Office of the Prime Minister
REDD	Renewable Energy Development Division
RFT	Request for Tender
RMU	Ring Main Unit
TEC	Tender Evaluation Committee
TC	Tender Committee

Introduction

Summary of Requirement

1. Through this Request For Tender (RFT), the Office of the Prime Minister (the 'Client' or OPM) intends to roll-out the upgrade works needed on the Atiu power distribution network (PDN) – high and low voltage systems. These works formed the second and final phase of the overall Atiu Power Upgrade (APU) Project where the first phase included the construction of a new power station with the installation of new state-of-the-art Cummings generators and automated control system. This RFT is for the supply and delivery, cost insurance and freight (CIF) to Rarotonga all high voltage (HV) electrical equipment necessary to complete the upgrading of the PDN.
2. The project site is the island of Atiu in the Southern Group of the Cook Islands. The majority of the work will be carried out along the main and arterial roads within the community including the main road between the airport on the coast and power station at the center of the island. Substation sites will be on both Crown and private lands.
3. The scope of works include the supply and delivery CIF to Rarotonga all HV electrical equipment necessary to successfully complete the works required under the APU Project.
4. Tenderers should note that the requirements relating to the lodgement and content of responses to this RFT as set out in Clauses 8 to 16 and Appendix A, are mandatory. The Client will exclude from the evaluation process, any tender that fails to comply with one or more of these mandatory requirements.
5. Tenderers must be registered with the Client upon receiving this RFT either by hardcopy or electronically. Notice to Tenders (NTT) will only be sent to those potential Tenderers who have registered their interests with the Client.
6. Tenders are invited from reputable manufacturers and suppliers of HV electrical equipment, offering to provide such service on a lump sum basis.
7. Tenders will be assessed in accordance with the evaluation criteria set out in Appendix C of this RFT.

Submission of Tender

8. Tenders shall be submitted in hard copies and in a single envelope.
   a) The envelope must contain all Tender Forms (A1 – A8) with supportive documents in three (3) sets (1 original and 2 copies).
   b) The envelope must be labelled "CONFIDENTIAL" and have the following information clearly exhibited on the outside:

TO:	Chief of Staff Office of the Prime Minister Avarua Rarotonga COOK ISLANDS
FROM:	(Name of Tenderer) (Tenderers address 1) (Tenderers address 2)

TENDER FOR: OPM/REDD-01/2015 – Supply and Delivery of High Voltage Electrical Equipment for the Atiu Power Upgrade Project

TENDER CLOSES: 1.00pm, Monday 6th April 2015

9. Tenders must be placed in the tender box by the due date. Failure to do so will result in the tender being disqualified.

10. Forms of Tender is specified in Appendix A. Copies of the Appendices in word format can be made available to the Tenderer on request.

11. Telefax and electronic tenders sent directly to the Client will not be accepted.

Tender Closing Time

12. This tender closes at 1.00pm on Monday 6th April 2015.

13. The tender box is located at the Renewable Energy Development Division (REDD) of the OPM, Avarua, Rarotonga, Cook Islands.

14. Tenderers are solely responsible for ensuring their tenders are placed in the tender box by the closing date and time.

15. Late tenders will not be accepted and will be excluded from the evaluation process.

Project Engineer

16. All enquiries in relation to this RFT should be made by email to the Project Engineer:

Name: Ngateina Rani
Telephone: (+682) 25494 Ext 824
Mobile: (+682) 54433
Email: ngateina.rani@cookislands.gov.ck

Further information or clarifications

17. Any further information or clarification required by a Tenderer in relation to this RFT, must be directed to the Project Engineer.

18. The Project Engineer may respond to enquiries received before the Enquiry Cut-Off Time (see Table 1) and may not be able to respond to those enquiries received after such time.

19. All requests and responses shall be given in writing and be circulated as NTTs, to all registered Tenderers. Where the Client considers that competitive advantage of the individual Tenderer may be compromised by the distribution of responses to such requests for information and/or clarification to all Tenderers, the Client reserves the right to issue such response(s) only to that particular Tenderer.

Key Dates

Table 1: Approximate Dates for this RFT

Details	Date
RFT Let	Saturday 14th March 2015
RFT Enquiry Cut-Off Time	1.00pm Friday 27th March 2015
Tender close	1.00pm Monday 6th April 2015

Tender evaluation complete	17th April 2015
Agreement/Purchase Order negotiation and award	1st May 2015
Agreement/Purchase Order commences	4th May 2015
Agreement/Purchase Order expires	4th September 2015

Note the dates from the 1st May 2015 onwards may change.

Selection Process

20. All tenders deposited and received from the tender box by the Closing Date and Time will be considered for evaluation. Tenders submitted in the form specified in Appendix A to this RFT will then proceed to the evaluation stage.

21. Evaluation of the tenders to this RFT will be in accordance with the Evaluation Criteria described in Appendix C. Failure to comply with the Standard Conditions set in this RFT will result in immediate exclusion from the evaluation process.

Notification of Acceptance

22. Tenders shall remain valid for acceptance and shall not be withdrawn for a period of sixty (60) working days from the Closing Date of this tender.

23. Unsuccessful Tenderers or its representatives shall be formally notified in writing (email sufficient) by the Client within ten (10) working days of acceptance of the successful Tenderer.

24. If no tender is accepted by the Client within sixty (60) working days after tender closing, each Tenderer will be notified in writing by the Client whether their tender is still under consideration or is no longer being considered.

25. The Client reserves the right to contact referees and/or customers of Tenderers regarding to the performance of the Tenderer as it may pertain to this RFT.

26. The Client shall not be bound to accept the lowest priced tender or the highest scored tender or any tender.

27. When the preferred Tenderer has been identified, the Client will invite the Tenderer to enter into negotiations based on possible changes to the items on the Schedules of Prices and Rates including the draft Purchase Order as per Appendices to this RFT. Only when both parties have agreed to the terms of the Agreement/Purchase Order and executed the Agreement/Purchase Order, then the Client will formally issue a Letter of Acceptance to the successful Tenderer.

28. Tenderers will not be entitled to see evaluation documents and no provision for appeal will be provided. Requests for further information leading to the cause of the decision will only be at the discretion of the Client.

29. If no tender has been accepted within the period stated, the Client will notify all Tenderers that no tender was accepted and may:

    a) Invite all Tenderers to provide additional information; and/or
    b) Re-advertise the RFT and extend the closing date. All registered Tenderers must resubmit new tenders to the Client.

Probity

30. No gifts or entertainment of any nature will be permitted between any parties involved throughout the tender process, including Tenderers or potential Tenderers, tender team members, Tender Evaluation Committee, the Chief of Staff, REDD Director, Project Engineer or any other member or organisation that may have some form of involvement with any aspect of the tender process.

Statement of Requirements

31. The specification of the Service to be delivered is described in Appendix B.

32. To enable the Service to be completed, tenders must include provisions for the Tenderer in the Tender Price to :

    a. Source, assemble, pack and deliver all HV electrical equipment;
    b. Provide all packing materials including labour to undertake the works;
    c. Arrange and pay all costs, whether direct or indirect, associated with the sourcing, packing and delivering of all HV electrical equipment to the Port of Rarotonga Cook Islands; and
    d. Update the Client on the delivery schedule particularly on the arrival of all HV equipment to the Port of Rarotonga Cook Islands.

33. The HV electrical equipment include a kiosk consisting a 200kVA step-up transformer, HV RMU and LV switchgear.

34. All HV electrical equipment are to be delivered CIF to the Port Of Rarotonga Cook Islands at the earliest and with the shortest lead-time.

35. The Tenderer must allow in their tender for all conditions on the shipping and handling of the equipment until it gets to the Port of Rarotonga, Cook Islands.

36. The tender price must include all costs associated with the manufacture, supply and delivery of HV electrical equipment to the Port of Rarotonga including freight and insurance.

37. Those interested Tenderers must be currently active in the manufacturing and distribution of these HV equipment.

38. The Tenderer must tender to complete the whole of the works specified in Appendix B and as required by the Agreement/Purchase Order.

Conditions of Tendering

Standard Conditions

39. Tenders must be completed in the format contained in Appendix A of this RFT. If Tenders do not comply with this format, these will be excluded from the evaluation process.

40. Tenders must be deposited in the tender box by the closing date and time as specified in Clause 12 of this RFT.

41. All Tenders and related documentations in response to this RFT must be in the English language.

42. Tenders must be presented in hardcopy formats only and delivered in sealed envelopes to the location specified in Clause 8 of this RFT. Telefax and electronic tenders will not be accepted. However these can be sent through to a local third party for printing and then get these deposited in the tender box before tender closing.

43. No Retention Security will apply to this Purchase Order or Contract.

44. N/A

45. N/A

Special Conditions

Registration of Tenderers

46. Prospective Tenderers must register their interest to participate in this RFT process by advising the Project Engineer either in writing (email sufficient) or telephone. Only registered Tenderers will receive Notices to Tenderers when these are issued. It is the responsibility of the Tenderer to ensure that he/she is properly registered for this RFT.

Information Supplied by Tenderer

47. The Client may ask Tenderers to provide additional information during the tender evaluation process. The Tenderer must provide such information in the form and within the time stated in the Client's request. Failure to do so may provide grounds for the Client not to continue evaluating your tender.

48. The Client may contact the Tenderer's referees, competitors, or customers to enquire on his/her performance and/or make any other enquiries that may deemed necessary.

49. Tenderers can provide additional documents/information to support their tender if necessary.

50. The Client reserves the right to request further clarification on any information or pricing supplied with any tender.

Cost of Tender Documents

51. The Tenderer will be required to pay a non-refundable fee of NZ$50.00 on collection of a printed copy of this RFT.

52. There is no fee charged for RFT documents obtained electronically from the Office of the Prime Minister. However, potential Tenderers who requested for electronic copies must ensure they are formally registered in accordance with Clause 46.

Negotiations

53. Negotiations will not take place in between the advertising and evaluation stages of the overall tendering process.

54. The Client may enter into post-offer negotiations with the preferred Tenderer and/or Tenderers before a Letter of Acceptance is issued.

Repudiation of Contract

55. If the tender is accepted and an Agreement is entered into with the successful Tenderer but the Tenderer withdraws from the Agreement or does not sign it within 5 working days of the Client asking the Tenderer to do so, the Client will consider or regard the Agreement as having ended.

Proposed Delivery Programme

56. The Tenderer is required to submit, on placement of their tender, a proposed delivery programme.

57. The proposed delivery programme must state a proposed commencement date and due date for completion and make a provision for the possibility of time extensions.

58. Tenderers may provide a proposed cashflow to reflect approximate value of the Agreement for the Agreement's duration.

59. The format for the Delivery Programme to be submitted by Tenderers is provided in Appendix A.

APPENDICES

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APPENDIX A – FORM OF TENDER

Instructions

1. Tenderers must complete and submit all of the following forms, in the formats provided in this Appendix:
   - A1 – Tender Form
   - A2 – Schedule of Prices
   - A3 – Technical Specifications
   - A4 – Schedule of Non-Conformances / Departures
   - A5 – Relevant Experience
   - A6 – Delivery Schedule
   - A7 – Referees
   - A8 – Copy of Company Certificate of Incorporation (if applicable)
2. In addition to Clause 1 above, Tenderers must submit a copy of any documentations from the manufacturer(s) on the equipment offered to be used as substitutes or departures than to what were specified.
3. Tenderers who fail to supply all of the items listed in Clauses 1 and 2 above, will be deemed non-compliant and will be excluded from the tender evaluation process.
4. Tenders shall be submitted in hardcopy format and in a single envelope.
   a) The envelope must contain all Forms (A1 – A8) and supportive documents in three (3) sets (1 original and 2 copies).
   b) The envelope must be labelled "CONFIDENTIAL" and have the following information clearly exhibited on the outside:

TO:	Chief of Staff Office of the Prime Minister Avarua Rarotonga COOK ISLANDS
FROM:	(Name of Tenderer) (Tenderer's address 1) (Tenderer's address 2)
TENDER FOR:	OPM/REDD-01/2015 – Supply and Delivery of High-Voltage Electrical Equipment for the Atiu Power Upgrade Project
TENDER CLOSES:	1.00pm, Monday 6th April 2015

A1 Tender Form

To: The Chief of Staff
Office of the Prime Minister
Avarua
Rarotonga
COOK ISLANDS

Tender for: **OPM/REDD-01/2015 – Supply and Delivery of High-Voltage Electrical Equipment for the Atiu Power Upgrade Project**

Supplier: _____

I/we, the undersigned, having examined the RFT documents including Notices to Tenderers _____, hereby offer to carry out the whole of the works for a Lump Sum Price of:

Amount	$_____
VAT	$_____
Total including VAT	**$**_____

I/We will achieve delivery in _____ weeks/working days from the date of signing the Agreement/Purchase Order.

I/We agree to abide by this tender for a period of sixty (60) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted by you at any time before the expiry of that period.

Unless and until an Agreement/Purchase Order is prepared and executed, this tender together with your written acceptance thereof, shall constitute a binding Contract or Agreement/Purchase Order between us.

I/We understand that you are not bound to accept the lowest or any tender that you may receive.

I/We understand that no Agreement/Purchase Order shall come into existence, and no legal or other obligations shall arise between us and you (or between us and any other agent of the Client) in relation to the conduct, outcome or otherwise of the tender process, prior to and apart from your acceptance of our tender.

I/We understand that you may contact the referees nominated by us in this offer and make whatever enquiries you deemed necessary regarding our financial health and ability to deliver the equipment.

The following information as required by this RFT is provided with this form:

1. A2 – Schedule of Prices
2. A3 – Technical Specifications
3. A4 – Schedule of Non-Conformances / Departures
4. A5 – Relevant Experience
5. A6 – Delivery Schedule
6. A7 – Referees

7. A8 – Copy of Company's Certificate of Incorporation (if applicable)

_____

Name of Tenderer (Print)

_____

Signature of person duly authorized to sign tenders on behalf of the Tenderer

_____

Position of person duly authorized to sign tenders on behalf of the Tenderer (Print)

_____

Physical address of Tenderer (Print)

_____	_____	_____
Telephone No	Facsimile No	Mobile No

_____

Email Address

_____

Signature of Witness of Tenderer

A2 Schedule of Equipment and Prices

Kiosk/Minipad and Stand-alone Ring Main Unit

EQUIPMENT DESCRIPTION	QTY	UNIT COST EXCL. OF VAT (NZD)	TOTAL COST EXCL. OF VAT (NZD)	TOTAL COST INCL. OF VAT (NZD)
1. Kiosk/minipad c/w 200kVA Step-up transformer, Safelink2 3-way CCF SF6 HV outdoor RMU and LV switchgear (250A isolator and MCCBs)	1			
2. Standalone Safelink2 4-way CCCC SF6 HV indoor RMU	1			
3. Insurance, international freight and documentation	1			
		TOTAL		

Note - Tenderers must ensure that their prices reflect all costs associated with the manufacture and safe delivery of the equipment to Rarotonga, Cook Islands.

A3 Technical Specifications

Step-Up 200kVA Transformer

The Tenderer shall supply at time of tendering as much of the information listed below as possible.

ITEM NO.	DESCRIPTION	UNIT	OFFER
1	**GENERAL**		
	Transformer nominal capacity	kVA	
	Manufacturer		
	Cross-sectional area of conductors		
	- HV windings	mm^2	
	- LV windings	mm^2	
	Maximum current density in windings		
	- HV windings	A/mm^2	
	- LV windings	A/mm^2	
	Zero sequence impedance, open-circuit		
	- HV windings	Ohms	
	- LV windings	Ohms	
	Zero sequence impedance, short-circuit		
	- HV windings	Ohms	
	- LV windings	Ohms	
	Magnetising current at rated voltage on principal tap	A	
	Winding capacitances:		
	HV winding - Core	µF/ph	
	LV winding - Core	µF/ph	
	HV winding - LV winding	µF/ph	
	Total volume of oil	litres	
	Volume of oil above level of winding excluding conservator oil	litres	
	Weight of core and windings	kg	
	Total weight of complete transformer ready for service	kg	
	Weight of transformer arranged for transport	kg	

	Filling medium for transport		
	Type of material used for gasket joints		
	Vacuum withstand capability:		
	- main tank	kPa	
	- conservator	kPa	
	- tap-change compartment	kPa	
	- radiators	kPa	
	Dimensions of main transport package:		
	- length	mm	
	- width	mm	
	- height	mm	
	Dimensions as installed		
	- length overall	mm	
	- width overall	mm	
	- height overall	mm	
2	**STANDARDS**		
	In accordance with IEC 76		
3	**TYPE**		
	Type		
4	**RATED POWER**		
	Maximum continuous rating on all tap positions at specified service conditions	kVA	
	Rating of windings:		
	- HV	kVA	
	- LV	kVA	
	Maximum winding hot spot temperature (ambient temperature 45^{o}C)	^{o}C	
	Maximum temperature rise in top oil	^{o}C	
	Maximum winding temperature rise measured by resistance	^{o}C	
5	**VOLTAGE RATIO**		
	No load voltage ratio:		
	Tap 1	kV	
	Tap 3	kV	
	Tap 6	kV	

6	**WINDING CONNECTIONS AND VECTOR GROUP**		
	Winding connections:		
	- HV		
	- LV		
	Vector group		
7	**INSULATION LEVELS**		
	Impulse withstand voltage:		
	- HV winding	kV peak	
	- LV winding	kV peak	
	- LV neutral		
	- Waveshapes for LV neutral	µsec	
	Power frequency test voltage:		
	- HV winding	kV rms	
	- LV winding	kV rms	
	- N winding	kV rms	
8	**IMPEDANCE VOLTAGE**		
	- Tap 1	%	
	- Tap 3	%	
	- Tap 6	%	
9	**SHORT-CIRCUIT PERFORMANCE**		
	Short-circuit withstand capabilities	kVA/2secs	
10	**REGULATION**		
	Regulation at full load (75degC) and unity power factor	%	
	Regulation at full load (75degC) and 0.8 lagging power factor	%	
11	**OVER-FLUXING**		
	Maximum permissible over-fluxing Volts/Hz in % of rated Volts/Hz:		
	- for 1 min	%	
	- for 30 mins	%	
	- Continuously	%	
	Flux density at rated voltage on principal tap	Tesla	
	Maximum flux. density in the transformer	Tesla	
	State conditions under which it occurs		

12	**HARMONIC CURRENTS**		
	3rd Harmonic as percentage of no load current	%	
	5th Harmonic as percentage of no load current	%	
	7th Harmonic as percentage of no load current	%	
13	**PARTIAL DISCHARGE**		
	Background level for partial discharge tests	pC	
14	**OFF-LOAD TAP-CHANGER**		
	Tap Changer:		
	- Manufacturer & Type No.		
	- Located in HV winding	Yes / No	
	- Range as % of nominal voltage	%	
	- Number of steps		
	- Impulse withstand level	kV	
	- 50Hz voltage withstand level (1 minute)	kV	
	Maximum Current Rating	A	
	Method of separating tap change selector switch from the main tank oil		
15	**COOLING AND TEMPERATURE CONTROL**		
	Cooling:		
	- radiators on main tank	Yes / No	
	Number of radiators		
	Surface area of each radiator	m^2	
16	**TANK AND ACCESSORIES SURFACE TREATMENT**		
	Method of surface treatment:		
	- Tank		
	- Radiators etc.		
17	**CONSERVATOR**		
	Total volume of conservator	litre	
18	**TRANSFORMER OIL**		
	Manufacture and type of transformer oil		
19	**TERMINALS BUSHINGS**		
	HV Bushings:		
	- Manufacturer - Type		

	- Total creepage distances to earth	mm	
	- Protected creepage distance to earth	mm	
	- Electrical clearance phase to phase	mm	
	- Electrical clearance to earth	mm	
	- Rated current	A	
	- Rated voltage	kV	
	- 1 min. 50Hz dry withstand voltage	kV	
	- 1 min. 50Hz wet withstand voltage	kV	
	- Impulse withstand voltage	kV	
	- Rated short-time current	kA	
	LV Bushings:		
	- Manufacturer		
	- Type		
	- Total creepage distances to earth	mm	
	- Protected creepage distance to earth	mm	
	- Electrical clearance phase to phase	mm	
	- Electrical clearance to earth	mm	
	- Rated current	A	
	- Rated voltage	kV	
	- 1 min. 50Hz dry withstand voltage	kV	
	- 1 min. 50Hz wet withstand voltage	kV	
	- Impulse withstand voltage	kV	
	- Rated short-time current (2 secs)	kA	
20	**NOISE LEVEL**		
	Guaranteed noise level	dB (A)	
21	**GUARANTEED LOSS**		
	Guaranteed no-load loss:		
	- Tap 1	kW	
	- Tap 3	kW	
	- Tap 9	kW	
	Guaranteed load loss (75^{o}C):		
	- Tap 1	kW	
	- Tap 3	kW	
	- Tap 9	kW	

Ring Main Unit CCF (RMU 3-Way)

The Tenderer shall supply at time of tendering as much of the information listed below as possible. This component shall be preinstalled inside the HV cubicle of the kiosk/minipad.

ITEM NO.	DESCRIPTION	UNIT	OFFER
1	**Switchgear information**		
	- Manufacturer		
	- Country of origin		
	- Catalogue/type designation		
	- Total switchgear mass, kg	kg	
	Switch-disconnector type		SF6 / Vacuum
	Switch-fuse combination switch-disconnector type		SF6 / Vacuum
2	**Switchgear Ratings**		
	- Voltage	kV	
	- Busbar Normal Current	A	
	- Insulation Level		
	- Peak lightning impulse withstand voltage	kV	
	- Short duration power frequency withstand voltage	kV	
	- Short time withstand current, Ik	kA	
	- Peak withstand current, Ip	kA	
	- Duration of short time current, Tk	µsec	
3	**Switch-fuse combination Ratings**		
	- Rated Current	A	
	- Fuse rating	A	
	- Off-load making capacity	A	
	- Duration of short time current, Tk	µsec	
	- Short circuit breaking capacity current	A	
	- Short circuit making current	A	
4	**Fuse Ratings**		
	- Fuse rating	A	
	- Fuse brand		
	- Fuse type		
	- Fuse length	mm	
	- Fuse diameter	mm	
	- Fuse blown indication		
	- Supply fuse curve		
5	**Switch-disconnector Ratings**		
	- Rated Current	A	
	- Breaking capacity	A	
	- Charging current	A	

	- Earth leakage fault		
	- No-load cable		
	- Duration of short time current, Tk		
	- Short circuit breaking capacity current	A	
	- Short circuit making current peak	A	
	- Short circuit making current peak for earth switches	kA	
	- Class of disconnector to IEC 60265		
6	**Ring main unit - General arrangement drawing showing overall dimensions (h, w, d in mm), cable termination locations and required space around unit for access and arc venting requirements for**		
	- Switch-disconnector functional unit		
	- Switch-fuse functional unit		
	- Total length of Ring Main unit with arc duct (if applicable)		
	- Required clearances at sides and rear of ring main unit		
	- Required clearance at front of ring main unit for installation & removal		
	- Required clearances on top of ring main unit		
	- Cable trench width		
	- Depth of protrusions into cable trench (if applicable)		
	- Total mass of Ring Main Unit		
	Ambient conditions assumed for stated current ratings above and applicable derating values for ambient of 50°C		
	Current ratings of switchgear at worst case ambient conditions		
	Surge arrester types accommodated		
	Surge arrester mounting details/restrictions		
	Gas pressure gauge installed		Yes/No
7	**Switchgear IEC Classifications**		
	- Internal arc classification		
	- Internal arc test current, kA Internal arc test duration		
	- Switch-disconnector mechanical durability class		

	- Switch-disconnector electrical durability class		
	- Switch-fuse combination mechanical durability class		
	- Switch-fuse combination electrical durability class		
	- Earth switch mechanical durability class		
	- Earth switch electrical durability class		
8	**Reliability Data**		
	- Failure Modes (for early, Normal life & wear out periods)		
	- Mean Operating Hours between failure modes		
	- Mean Time To Repair. Provide details of any special requirements, test and support equipment etc.		
	- Number of units in service in New Zealand/Australia		
	- Period (years) this model/type has been available for purchase		
	- Number of units in service worldwide		
	Details of lifting and slinging for individual functional units		
	Description of the panel busbar interconnection arrangements		
	Description of all operational and safety interlocking arrangements		
	Table of all possible and inhibited states that the switch-fuse combinations and switches in the switchgear may occupy		
	Analysis demonstrating the integrity of all interlocking arrangements which include an analysis of all possible failure modes and the controls designed into managing them		
	Clearance hole or stud size of earthing bar offered		
	Gas used for insulation of bus bar		
	In which compartments are the gas used		

	Detail of gas pressure monitoring device		
	Quantity of the SF6 to be used in each separately filled compartment		
	Specify the degree of SF6 gas tightness for the switchgear		
	If the switch-disconnectors or switch-fuse disconnector is a vacuum type state the method of indicating vacuum loss (if any)		
	Is the switch-disconnector offered 3-way		Yes / No
	Details of the circuit earthing facilities offered including the method of indicating the position of the earthing switch and guaranteeing the integrity of that indication		
	Diameter of the earth clamping screw		
	Number of switch-fuse combination unit spare auxiliary contacts		
	Number of switch-disconnector spare auxiliary contacts		
	Type of circuit test facility offered		
	Describe the test plugs		
	Type of switch-disconnector offered		
	Type of cable termination offered. Specify manufacturer, model and full details of separable insulated connector. Detail shielding arrangement to be included		
	Type and ratings of live line indicators		

Ring Main Unit CCCC (RMU 4-Way)

The Tenderer shall supply at tendering as much of the information listed as possible. This equipment will be installed inside a concrete building.

ITEM NO.	DESCRIPTION	UNIT	OFFER
1	**Switchgear information**		
	- Manufacturer		
	- Country of origin		
	- Catalogue/type designation		
	- Total switchgear mass, kg	kg	
	Switch-disconnector type		SF6 / Vacuum
	Switch-fuse combination switch-disconnector type		SF6 / Vacuum
2	**Switchgear Ratings**		
	- Voltage	kV	
	- Busbar Normal Current	A	
	- Insulation Level		
	- Peak lightning impulse withstand voltage	kV	
	- Short duration power frequency withstand voltage	kV	
	- Short time withstand current, Ik	kA	
	- Peak withstand current, Ip	kA	
	- Duration of short time current, Tk	µsec	
3	**Switch-fuse combination Ratings**		
	- Rated Current	A	
	- Fuse rating	A	
	- Off-load making capacity	A	
	- Duration of short time current, Tk	µsec	
	- Short circuit breaking capacity current	A	
	- Short circuit making current	A	
4	**Fuse Ratings**		
	- Fuse rating	A	
	- Fuse brand		
	- Fuse type		
	- Fuse length	mm	
	- Fuse diameter	mm	
	- Fuse blown indication		
	- Supply fuse curve		
5	**Switch-disconnector Ratings**		
	- Rated Current	A	
	- Breaking capacity	A	
	- Charging current	A	

	- Earth leakage fault		
	- No-load cable		
	- Duration of short time current, Tk		
	- Short circuit breaking capacity current	A	
	- Short circuit making current peak	A	
	- Short circuit making current peak for earth switches	kA	
	- Class of disconnector to IEC 60265		
6	**Ring main unit - General arrangement drawing showing overall dimensions (h, w, d in mm), cable termination locations and required space around unit for access and arc venting requirements for**		
	- Switch-disconnector functional unit		
	- Switch-fuse functional unit		
	- Total length of Ring Main unit with arc duct (if applicable)		
	- Required clearances at sides and rear of ring main unit		
	- Required clearance at front of ring main unit for installation & removal		
	- Required clearances on top of ring main unit		
	- Cable trench width		
	- Depth of protrusions into cable trench (if applicable)		
	- Total mass of Ring Main Unit		
	Ambient conditions assumed for stated current ratings above and applicable derating values for ambient of 50°C		
	Current ratings of switchgear at worst case ambient conditions		
	Surge arrester types accommodated		
	Surge arrester mounting details/restrictions		
	Gas pressure gauge installed		Yes/No
7	**Switchgear IEC Classifications**		
	- Internal arc classification		
	- Internal arc test current, kA Internal arc test duration		
	- Switch-disconnector mechanical durability class		

	- Switch-disconnector electrical durability class		
	- Switch-fuse combination mechanical durability class		
	- Switch-fuse combination electrical durability class		
	- Earth switch mechanical durability class		
	- Earth switch electrical durability class		
8	**Reliability Data**		
	- Failure Modes (for early, Normal life & wear out periods)		
	- Mean Operating Hours between failure modes		
	- Mean Time To Repair. Provide details of any special requirements, test and support equipment etc.		
	- Number of units in service in New Zealand/Australia		
	- Period (years) this model/type has been available for purchase		
	- Number of units in service worldwide		
	Details of lifting and slinging for individual functional units		
	Description of the panel busbar interconnection arrangements		
	Description of all operational and safety interlocking arrangements		
	Table of all possible and inhibited states that the switch-fuse combinations and switches in the switchgear may occupy		
	Analysis demonstrating the integrity of all interlocking arrangements which include an analysis of all possible failure modes and the controls designed into managing them		
	Clearance hole or stud size of earthing bar offered		
	Gas used for insulation of bus bar		
	In which compartments are the gas used		

	Detail of gas pressure monitoring device		
	Quantity of the SF6 to be used in each separately filled compartment		
	Specify the degree of SF6 gas tightness for the switchgear		
	If the switch-disconnectors or switch-fuse disconnector is a vacuum type state the method of indicating vacuum loss (if any)		
	Is the switch-disconnector offered 4-way		Yes/No
	Details of the circuit earthing facilities offered including the method of indicating the position of the earthing switch and guaranteeing the integrity of that indication		
	Diameter of the earth clamping screw		
	Number of switch-fuse combination unit spare auxiliary contacts		
	Number of switch-disconnector spare auxiliary contacts		
	Type of circuit test facility offered		
	Describe the test plugs		
	Type of switch-disconnector offered		
	Type of cable termination offered. Specify manufacturer, model and full details of separable insulated connector. Detail shielding arrangement to be included		
	Type and ratings of live line indicators		

Low Voltage (LV) Switchgear

ITEM NO.	COMPONENT	BRAND, TYPE, RATING, ETC.
1	LV Switchboard Fit-out	
	- Frame including Earth bar	
	- Formica mounting board	
	- Bushing shroud	
	- 250A Isolator	

	- MCCB chassis	
	- 250A MCCB c/w 200 thermal magnetic overload	
	- 100A MCCBs c/w 63A thermal magnetic overload	
	- LV cabling between transformer bushings and isolator	

These components must be preinstalled inside the LV cubicle of the kiosk/minipad containing the step-up transformer and the 3-way HV RMU.

A4 Schedule of Non-Conformances / Departures

List all the non-conformance issues / departures and substitutes.

ITEM NO.	SPECIFICATION CLAUSE OR SCHEDULE	DESCRIPTION OF NON-CONFORMANCE / DEPARTURE

A5 Relevant Experience

List the last three (3) Projects of similar nature and scale that you have been involved in the past.

PROJECT	
CLIENT	
COMPLETION DATE	
PROJECT DURATION	
ACTIVITIES PERFORMED	
CONTRACT VALUE	$

PROJECT	
CLIENT	
COMPLETION DATE	
PROJECT DURATION	
ACTIVITIES PERFORMED	
CONTRACT VALUE	$

PROJECT	
CLIENT	
COMPLETION DATE	
PROJECT DURATION	
ACTIVITIES PERFORMED	
CONTRACT VALUE	$

A6 Delivery Schedule

Provide delivery schedule.

DETAILS	DURATION	PROPOSED DATES OF ACTION

A7 Referees

Provide details of your referees so that the Client can contact them for clarifications.

NAME	
ADDRESS	
CONTACT NO.	
EMAIL ADDRESS	
NAME OF PROJECT	

NAME	
ADDRESS	
CONTACT NO.	
EMAIL ADDRESS	
NAME OF PROJECT	

NAME	
ADDRESS	
CONTACT NO.	
EMAIL ADDRESS	
NAME OF PROJECT	

A8 Copy of Certificate of Incorporation

Attach a copy of Certificate of Incorporation if applicable.

APPENDIX B – TECHNICAL SPECIFICATIONS

B1 Step-Up Transformer

PART 1 – GENERAL

1. SCOPE

This specification covers the design, engineering, manufacture, testing, supply, delivery, offloading and performance requirements of one 200kVA 11kV step-up power transformer for use on Atiu Island's proposed 11kV network. The transformer shall be double copper wound, three phase, oil-immersed with ONAN cooling and fitted with off-load tap changer. The transformer shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Client shall have the power to reject any work or material, which, in his judgement, is not in full accordance therewith.

2. STANDARDS

Except where modified by this specification, the transformer shall be designed, manufactured and tested in accordance with the latest editions of the following standards. The Supplier may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. Acceptability of any alternative standard is at the discretion of the Client. The Supplier shall furnish a copy of the alternative standard proposed along with the bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In the case of conflict the order of precedence shall be 1) IEC or ISO Standards, 2) Australian/New Zealand Standards, 3) other alternative standards.

IEC / ISO	Subject
IEC 71	Insulation co-ordination
IEC 76 (1 - 5)	Power transformers
IEC 137	Bushings for alternating voltages above 1000 volts
IEC 214	Off-Load tap changers
IEC 296	Specification for unused mineral oils for transformers and switchgear
IEC 354	Loading guide for oil immersed transformers
IEC 437	Radio influence voltage measurement
IEC 518	Dimensional standardisation of terminals for high voltage switchgear and control gear
IEC 529	Degrees of protection provided by enclosures
IEC 542	Application guide for off-load tap changers
IEC 551	Measurement of transformer and reactor sound levels
IEC 606	Application guide for power transformers

IEC 616 Terminal and tapping markings for power transformers

ISO 1460 Galvanising

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Supplier of the necessity of providing the equipment complying with other relevant standards or recommendations.

3. SERVICE CONDITIONS

The service conditions shall be as follows:

- Maximum altitude above sea level 100m
- Maximum ambient air temperature 50°C
- Maximum daily average ambient air temperature 35°C
- Minimum ambient air temperature 20°C
- Maximum yearly weighted average ambient temperature 32°C
- Maximum relative humidity 90%

Environmentally, the island where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore south-east trade winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators Therefore, outdoor material and equipment shall be designed and protected for use in exposed, salty, corrosive and tropical coastal atmosphere.

Indoor material and equipment shall be designed and protected for use in kiosk, buildings, which occasionally may be wet and damp.

4. SYSTEM CONDITIONS

The equipment shall be suitable for installation in supply systems of the following characteristics:

- Frequency 50Hz
- Nominal system voltage 11kV/415-240V
- Maximum system voltages 11kV System 12kV, LV System 439.9V
- Minimum LV voltage 390.1V
- Nominal short circuit levels 11kV System 12.5kA
- Insulation levels
  1.2/50ms impulse withstand (positive and negative polarity) 11kV System 75kV
- Power frequency one minute withstand (wet and dry) 11kV System 28kV / LV System 3kV
- Neutral earthing arrangements 11kV System solidly earthed
  LV System solidly earthed

5. COMPLIANCE WITH SPECIFICATION

The transformer shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of tendering.

6. COMPLIANCE WITH REGULATIONS

All HV equipment shall comply in all respects with the Australian or New Zealand Standards, Regulations and Acts in force. The equipment and connections shall be designed and arranged to minimise the risk of fire and any damage which might be caused in the event of fire.

7. QUALITY ASSURANCE, INSPECTION AND TESTING

7.1. General

To ensure that the supply and services under the scope of this Contract, whether manufactured or performed within the Supplier's works or at any other place of work are in accordance with this specification, with the regulations and with relevant authorised International or Australian/New Zealand, the Supplier shall adopt suitable quality assurance programmes and procedures to ensure that all activities are being controlled as necessary.

The quality assurance arrangements shall conform to the relevant requirements of ISO 9001 or ISO 9002 as appropriate. The systems and procedures which the Supplier will use to ensure that the plant complies with the Contract requirements shall be defined in the Supplier's quality plan for the works.

The Supplier shall operate systems which implement the following:

Hold Point "A stage in the material procurement or workmanship process beyond which work shall not proceed without the documented approval of designated individuals or organisations."

The Client's written approval is required to authorise work to progress beyond the Hold Points indicated in approved quality plans.

Notification Point "A stage in material procurement or workmanship process for which advance notice of the activity is required to facilitate witness."

If the Client does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

7.2. Quality Assurance Programme

Unless the Supplier's quality assurance system has been audited and approved by the Client, a Quality Assurance Programme for the Works shall be submitted to the Client for approval a minimum of one month from Contract award, or such other period as shall be agreed with the Client. The Quality Assurance Programme shall give a description of the quality system for the works and shall, unless advised otherwise, include details of the following:

- The structure of the organisation
- The duties and responsibilities assigned to staff ensuring quality of work
- The system for purchasing, taking delivery and verification of materials
- The system for ensuring quality of workmanship
- The system for control of documentation
- The system for the retention of records
- The arrangements for the Supplier's internal auditing

A list of the administration and work procedures required to achieve and verify Contract's quality requirements. These procedures shall be made readily available to the Client for inspection on request.

7.3. Quality Plans

The Supplier shall draw up for each section of the work quality plans which shall be submitted to the Client for approval at least two weeks prior to the commencement of work on the particular section. Each quality plan shall set out the activities in a logical sequence and, unless advised otherwise, shall include the following:

An outline of the proposed work and programme sequence

- Submission of engineering documents required by the specification
- The inspection of materials and components on receipt
- Reference to the Supplier's work procedures appropriate to each activity
- Inspection during fabrication/construction
- Final inspection and test

7.4. Non-conforming Product

The Client shall retain responsibility for decisions regarding acceptance, modification or rejection of non-conforming items.

7.5. Sub-contractors

The Supplier shall ensure that the quality assurance requirements of this specification are followed by any sub-contractor appointed by him under the Contract.

The Supplier shall assess the sub-contractor's quality assurance arrangements prior to his appointment to ensure compliance with the appropriate ISO 9000 standard and the specification. Auditing of the sub-contractor's quality assurance arrangements shall be carried out by the Supplier and recorded in such a manner that demonstrates to the Client the extent of the audits and their effectiveness.

7.6. Inspection and Testing

If required, the Client shall have free entry at all times, while work on the Contract is being performed, to all parts of the manufacturer's works which concern the processing of the equipment ordered.

The manufacturer shall afford the Client without charge, all reasonable facilities to assure that the equipment being furnished is in accordance with this specification.

The equipment shall successfully pass all the type tests and routine tests referred to this specification.

The Client reserves the right to reject an item of equipment if the test results do not comply with the values specified or with the data given in the technical data schedule. Type tests shall be carried out at an independent testing laboratory or be witnessed by a representative of such laboratory or some other representative acceptable to the Client.

Routine tests shall be carried out by the Supplier at no extra charge at the manufacturer's works.

Type tests may be dispensed with at the Client's discretion if the Supplier furnishes evidence to the Client's satisfaction that the relevant tests have already been performed on identical equipment. In this case test certificates shall be submitted with the bid for evaluation.

The Client may witness routine and type tests. In order to facilitate this, the Supplier shall give the Client a minimum of four-week notice that the material is ready for testing. If the Client does not indicate his intention to participate in the testing, the manufacturer may proceed with the tests and shall furnish the results thereof to the Client.

Full details of the proposed methods of testing, including connection diagrams, shall be submitted to the Client by the Supplier for approval, at least one month before testing.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Supplier who shall provide the Client with all the test facilities which the latter may require, free of charge. The Client shall have the right to select the samples for test and shall also have the right to assure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the Supplier at an approved laboratory and shall be approved by the Client.

The Supplier shall be responsible for the proper testing of the plant or materials supplied by sub-contractors to the same extent as if the work, plant or materials were completed or supplied by the Supplier.

Any cost incurred by the Client in connection with inspection and re-testing as a result of failure of the equipment under test or damage during transport or offloading shall be to the account of the Supplier.

The Supplier shall submit to the Client signed copies of the test certificates, giving the results of the tests as required. No materials shall be dispatched until the test certificates have been received by the Client and the Supplier has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and not merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in Part 2, or in the quoted standards in Clause 2, of this specification, the Supplier shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

No inspection or lack of inspection or passing by the Client's Representative of equipment or materials whether supplied by the Supplier, shall relieve the Supplier from his liability to complete the Contract works in accordance with the Contract or exonerate him from any of his guarantees.

7.7. Guarantee

The Supplier shall guarantee the following:

- Quality and strength of materials used
- Satisfactory operation during the guarantee period of FIVE (5) years from the date of commissioning, or 72 months from the date of acceptance of the equipment by the Client following delivery, whichever is the earlier
- Performance figures as supplied by the Supplier in the schedule of guaranteed particulars.

8. SPARE PARTS AND SPECIAL TOOLS

The Supplier shall provide a list of recommended spare parts together with their individual prices.

This list shall identify all essential spares and consumable items for any recommended maintenance for a period of five years after commissioning.

The Client may order all or any of the spare parts listed at the time of Contract award and the spare parts so ordered shall be supplied as part of the definite works. The Client may order additional spares at any time during the contract period at the rates stated in the Contract document.

The Supplier shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment, which shall be 25 years minimum. However, the Supplier shall give a minimum of 12-month notice in the event that the Supplier's plan to discontinue manufacture of any component used in this equipment.

Any spare parts or tools shall be subject to the same specification, tests and conditions as similar material supplied under the definite work section of the Contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the plant and must be suitably marked and numbered for identification.

Spare parts shall be delivered suitably packed and treated for long periods in storage. Each pack shall be clearly and indelibly marked with its contents, including a designation number corresponding to the spare parts list in the operation and maintenance instructions.

9. PACKING AND SHIPPING

9.1. Packing

The equipment and any supporting structures are to be transported adequately and sealed against water ingress. All accessories and spares shall be packed and securely clamped against movement in robust, wooden, non-returnable packing cases or on pallets to ensure safe transit in rough terrain, cross country road conditions and in heavy rains from the manufacturer's works to the work sites.

Equipment or material liable to deterioration by sea water, moisture, or ingress of foreign matter shall be totally sealed in strong polythene bags and those liable to deterioration due to condensation shall be protected by packs of silica gel or other approved desiccant.

All accessories shall be carefully packed so that they are fully protected during transport and handling operations and in storage. Internal surfaces of loose accessories shall be sealed by means of gaskets and blanking off plates. All parts liable to rust shall receive an anti-rusting coat and shall be suitably protected. It shall be the responsibility of the Supplier to make good any damage caused through insufficient packing. Palletized and shrinking wrapping should also be considered.

Each packing case shall be indelibly marked, on two adjacent sides and on the top, with the following:

- Individual serial number
- Client's name
- Contract number
- Destination
- Supplier's name
- Name and address of Supplier
- Description and numbers of contents
- Manufacturer's name

- Country of origin
- Case measurements
- Gross and net weights in kilograms and
- All necessary slinging and stacking instructions

Each crate, pallet or sea container shall be marked clearly on the outside of the case to show TOP and BOTTOM positions with appropriate signs to indicate where the mass is bearing and the correct positions for slings. All component parts which are separately transported shall have permanent identification marks to facilitate correct matching and assembly at site. Welded parts shall be marked before welding.

Copies of each packing list shall be sent to the Client prior to dispatching the equipment.

9.2. Shipping

The Supplier shall be responsible for the shipping of all HV equipment supplied from the Port of departure to the port of destination (Rarotonga, Cook Islands) including customs clearance, offloading, warehousing and insurance.

The Supplier shall advise the storage requirements for any plant and equipment that may be delivered to the Client's stores.

9.3. Hazardous substances

The Supplier shall submit safety data sheets for all hazardous substances used with the equipment. The Supplier shall give an assurance that there are no other substances classified as hazardous in the equipment supplied. No oil shall be supplied or used at any stage of manufacture or test without a certificate acceptable to the Client that it has a PCB content of less than 2mg/kg. The Supplier shall accept responsibility for the disposal of such hazardous substances, should any be found.

The Supplier shall also be responsible for any injuries resulting from hazardous substances due to non-compliance with these requirements.

PART 2: TECHNICAL

10. TYPE OF TRANSFORMER

The transformer shall be double copper wound, three phase, oil immersed, 11kV, 50 Hz with off-load tap-changer mounted in the LV end.

The transformer shall be naturally cooled, Type ONAN.

11. RATED CAPACITY

The kVA rating of the step-up transformer shall be 200kVA based on natural cooling. The transformer shall be capable of supplying its rated power continuously at all tap positions with rated voltage on the LV winding. The transformer shall also be capable of delivering rated current at an applied voltage equal to l05% of the rated voltage.

The transformer shall be capable of supplying its rated power continuously under ambient temperature conditions without the temperature rise of the top oil exceeding 50^{o}C and without the temperature rise of the windings as measured by resistance exceeding 55^{o}C. The ambient temperature conditions are as follows:

- Maximum ambient temperature 50°C
- Maximum daily average ambient temperature 35°C
- Maximum yearly weighted average ambient temperature 32°C

The transformer may be overloaded during emergency up to 150% of its continuous rating. Bushings, tap changer and other current-carrying parts shall also be designed for this condition.

12. VOLTAGE RATIO

Each transformer shall be supplied with an on load tap changer (as specified) connected to the high voltage winding. The tap changer shall have 6 tap positions and shall be so arranged as to give variations of transformation ratio in equal steps of 2.5% per step. The total range of the tap changer shall be from +5.0 percent to -7.5 percent. Tap 3 shall be the principal tap and the transformation ratio at this tap shall be 11.00 kV.

The no-load voltage ratios shall be as follows:

Tap No.	High Voltage (V)	Low Voltage (V)
1	11550	415
2	11275	415
3	11000	415
4	10725	415
5	10450	415
6	10175	415

13. WINDING CONNECTIONS AND VECTOR GROUP

The transformers shall be connected as follows:

HV Winding:	Delta connected
LV Winding:	Star connected
Vector Group:	YNd1

14. INSULATION LEVELS

The transformers shall be designed and tested to the following insulation levels:

Line Terminals	Power Frequency Voltage (rms)	Lightning Impulse Voltage (peak)
11kV	28kV	75kV (1.2/50 µsec)

The windings shall be uniformly insulated and the low voltage neutral point shall be insulated for full voltage.

15. IMPEDANCE VOLTAGE

The impedance on the principal tap (Tap 3) shall not exceed 5%, the Supplier must provide this figure.

The impedance voltage refers to the principal tapping. No negative tolerance on this percentage impedance is allowed. A positive tolerance of +10%.

16. SHORT CIRCUIT PERFORMANCE

The transformer shall be capable of withstanding the thermal and dynamic effects of short circuits.

The transformer shall be capable of withstanding for 2 seconds a bolted metallic short circuit on the terminals of either winding with rated voltage on the other winding and the tap-changer in any position.

If short circuit tests have been carried out on the particular design of the transformer offered, the test results shall be supplied with the bid.

17. REGULATION

The regulation of the transformer from no-load to continuous rated output at 1.0 power factor and at 0.8 lagging power factor shall be as guaranteed in the Technical Data Schedules.

18. FLUX DENSITY

Each transformer shall be capable of operating continuously with rated current and with system maximum voltage applied to the low voltage winding at a frequency of 96 per cent of rated frequency without exceeding the temperature rise specified in Clause 11.

The limit of flux density at normal voltage and frequency shall be subject to the requirements for losses, harmonics and noise suppression but in any event shall not exceed 1.6 Tesla.

The transformer core shall not be saturated at maximum system voltage.

19. HARMONIC CURRENTS

The transformer shall be designed with particular attention to the suppression of harmonic voltages, especially the 3rd, 5th and 7th harmonics, so as to eliminate wave form distortion and the possibility of high frequency disturbances, induction effect or of circulating current between neutral points at different transformer stations.

20. PARTIAL DISCHARGE

The transformer shall be partial discharge free up to 120% of rated voltage as the voltage is reduced from 150% of rated voltage i.e. there shall be no significant rise above background level.

21. OFF-LOAD TAP-CHANGER

The transformer shall be provided with an off-load tap-changer connected to the high voltage winding. The off-load tap-changer shall be capable of withstanding the voltages described in Clause 14.

Its tapping range, number of steps and tap positions shall be as specified in Clause 12.

Adequate access for personnel shall be provided for inspection and maintenance. The guaranteed interval between maintenance periods for the diverter switch shall be 10 years or 50,000 operations.

It shall not be possible for oil in the diverter switch compartment to come in contact with the oil in the main transformer tank.

22. COOLING

The banks of cooling radiators shall be detachable from the tank for transport and maintenance. Shut-off valves shall be provided on the tanks of the transformers for this purpose. An air-vent and draining plug shall be provided on each radiator bank. All external surfaces of the radiators shall be hot-dip galvanised.

23. TANK AND ACCESSORIES

23.1. General

The transformer tank shall be kiosk mounted type. The transformer tank shall be designed so that the complete transformer with oil and excluding conservator and radiators can be lifted and transported without permanent deformation or oil leakage.

The tank and cover including the stiffeners shall be designed in such a manner as to leave no external pockets in which water can lodge, or internal pockets where gas/air can collect. All fittings shall be designed so as to prevent entry of air or leakage of oil from the tank.

All pipes, shall be externally welded to the tank wall.

The tank and cover shall be of structural quality, weldable stainless steel 316 with a minimum thickness of 3mm. All welding shall be stress relieved.

The tank lid shall not be welded shut, but shall be secured by bolts and provided with suitable oil-tight gasket.

23.2. Surface Treatment

The transformer tank and accessories shall be adequately protected against corrosion. The inside of the tank shall be painted with an approved oil resisting varnish. The outside of the tank shall be painted. External surfaces of radiators shall be hot-dip galvanised.

23.3. Conservator Tank

A conservator tank shall be provided of adequate capacity between lowest and highest visible levels to meet expansion of oil from 0^{o}C to 100^{o}C. A suitable oil level gauge shall be located on the tank so that it can be easily read from ground level. The gauge shall be graduated for temperatures of 0^{o}C, +45^{o}C and +90^{o}C.

Each gauge shall be provided with contacts for separate low oil level alarm and trip signals. The conservator shall be fitted with a filling hole with cap and drain valve. It shall be inclined at about 5 degrees towards the drain valve. The pipe connecting the conservator to the main tank shall project 20mm above the bottom of the conservator for collection of impurities.

23.4. Breather

The conservator tank shall be fitted with a breather in which silica gel is the dehydrating agent.

The breather shall be a moulded type transparent case of adequate size and so designed that:

The passage of air through the silica gel does not give rise to any excess pressure rise

Silica gel crystal of not less than 5mm. size is used

The silica gel is sealed from the external atmosphere by means of an oil seal

The moisture absorption indicated by a change in colour of the crystals can be easily observed from a distance

The breather mounting height facilitates maintenance from ground level without switching out the transformer

23.5. Explosion Vent or Pressure Relief Device

An explosion vent or pressure relief device shall be provided to release any severe build-up of pressure within the tank. The vent shall be designed such that in the event of an explosion, rain, sand or any other foreign bodies are prevented from getting into the tank. The vent shall be positioned so as to direct the explosion safely into the oil pit.

23.6. Oil Sampling Devices

Oil sampling devices shall be fitted to the main tank. They shall be located suitably for easy access especially during maintenance, one near the bottom of the tank and one near the top.

23.7. Earthing Terminals

Earthing terminals shall be provided on the transformer close to each of the four corners of the tank to facilitate easy earthing of the transformer on site.

23.8. Oil Valves

In addition to the valves already mentioned, a drain valve shall be provided near the bottom of the tank. All oil valves shall be provided with means for securing them in the open or closed position.

24. CORE AND WINDINGS

24.1. Core

The core shall be constructed from high grade, non-ageing, cold rolled grain oriented silicon steel laminations or superior material.

The core and winding shall be capable of withstanding shocks during transport, installation and service. Provision shall be made to prevent movement of the core and windings relative to the tank during these conditions and also during short circuits.

The design shall avoid the presence of pockets which would prevent the complete emptying of the tank through the drain valve.

24.2. Windings

The winding conductor shall be of electrolytic copper. The insulation shall be free from insulating compounds which are liable to soften, ooze out, shrink or collapse. It shall be non-catalytic and chemically inert in transformer oil during normal service.

The stacks of windings are to receive adequate shrinkage treatment.

The windings and connections are to be braced to withstand shocks during transport, switching, short circuit or other transient conditions.

25. THERMOMETERS

N/A

26. TRANSFORMER OIL

The insulation oil shall be mineral oil and standard used by the Supplier. The complete first filling shall be of new oil free from inhibitors and additives.

The transformer shall be shipped with oil filled at least to cover the core and coil assembly and the balance, with two percent extra quantity to cover spillage during filling to be supplied in non-returnable steel drums.

27. BUCHHOLZ AND GAS PRESSURE RELAYS

A double float Buchholz relay shall be provided in the pipe connection from the main tank to the oil conservator. It shall be provided with isolating valves. The upper float of the Buchholz relay shall operate a contact to give an alarm on accumulation of gases caused by a gradual fault. The lower float shall operate a contact to make a circuit to trip associated circuit breakers in the event of further gas accumulation or a sudden flow of oil caused by an explosive development of gases.

The gas release connection from the Buchholz relay shall be brought down to a gas sampling device accessible from the ground to facilitate sampling with the transformer in service. The test connection from the Buchholz relay may be brought to the gas sampling device if suitable or may be terminated beside it. Isolating valves accessible from ground level shall be provided in both of these connections.

The gas sampling device shall have the following facilities:

(1) Gas connection from the Buchholz relay through an isolating valve on the gas sampling device.

(2) Coupling in the pipe connections to enable the device to be removed from the transformer.

(3) Gas sampling valve at the top with outlet approximately 3mm diameter to make rubber tube connection. The outlet shall have a captive screwed cap.

(4) Oil drain valve at the bottom with blanking plug.

(5) The oil level in the device shall be visible from the front.

An oil surge relay shall be mounted in the pipe leading from the tap-changer head to the oil conservator. The relay shall be actuated by an oil flow caused by a tap-changer fault and its contact shall make a circuit to trip associated circuit breakers and provide annunciation in the control room.

28. TERMINALS

Indoor bushings to suit kiosk installation shall be provided for the 11 kV terminations. The 11 kV termination shall not include a neutral bushing. All bushing shall have a minimum creepage distance of 25 mm/kV. The protected creepage distance shall not be less than 50% of the total.

All bushings and terminations shall have a continuous current rating of 200 % of the transformer rating and a 3 second short time rating equal to nominal short circuit current of the system.

Bushing shall be easily replaceable. Cemented in types will not be accepted. These shall be sufficiently robust to withstand the normal transport and erection hazards.

11 kV bushing terminals shall be suitable for connection of multiple copper conductors using appropriate connectors.

28.1. Terminal Markings

The terminal markings shall be clearly and permanently shown. Painted markings are not acceptable. The windings shall be labelled as follows:

High Voltage: 3 phases and neutral U V W

Low Voltage: 3 phases and neutral u v w n

Terminals U, V, W and u, v, w shall be connected to phases R, Y, B, respectively.

29. NOISE LEVEL AND RADIO INFLUENCE LEVEL

The noise level shall be guaranteed by the Supplier.

The guaranteed value shall be stated in the Technical Schedules and the measured noise level shall not exceed this value.

The maximum radio influence voltage shall be 250μV.

30. LABELS AND RATING PLATES

Labels, plates, markings, and instructions shall be clear and indelible and in the English language. Cast-in or moulded-in words not in English shall be covered with a permanently fixed non-ferrous label inscribed in English.

A rating plate shall be provided. In addition a plate showing the location of all valves and air release cocks or plugs shall be provided.

31. LOSS CAPITALISATION

N/A

32. TESTING

32.1. General

Tests shall be carried out on transformers as specified below.

32.2. Type Tests

The following shall be regarded as type tests:

(a) Test of temperature rise. This test shall be carried out on the tap having maximum losses

(b) Measurements of open-circuit and short-circuit zero-sequence impedances of the HV and LV windings

(c) Measurement of capacitances

(d) Short circuit test

(e) Impulse Test

(i) Full-wave impulse voltage withstand test. The test voltage shall be applied to each line and neutral terminal. The applied voltage shall be the relevant lightning impulse voltage specified in the clause on Insulation Levels.

(ii) Chopped-wave impulse voltage withstand test. The test voltage shall be applied to line terminals only. The applied voltage shall be 115% of the relevant lightning impulse voltage specified in the clause on Insulation Levels.

The test sequence to each terminal shall be as follows:

- One reduced full impulse (calibration)
- One 100% full impulse
- Two 115% chopped impulse
- Two 100% full impulse

(g) Noise level measurement using a precision sound level meter. In addition the test shall be repeated with narrow band filters for the harmonic frequencies from 100Hz. up to 350 Hz.

(h) Vacuum Test

(i) Tap-changer tests required are as follows:

- temperature rise of contacts
- switching tests
- short-circuit current test
- transition impedance test
- mechanical tests
- dielectric tests

32.3. Routine Tests

The following shall be regarded as routine tests and shall be carried out on the transformer:

(a) Measurement of winding resistance at principal tap and two extreme taps

(b Voltage-ratio measurement and check of vector group

(c) Measurement of the impedance voltage at principal tap and two extreme taps

(d) Measurement of the load loss

(e) Measurement of no-load loss and no-load current, including measurement of harmonics

(f) Applied voltage test to all auxiliary circuits

(g) Tests on off-load tap-changer (fully assembled on transformer)

(h) Induced over-voltage withstand test. The voltage applied shall be the relevant power frequency voltage specified in the clause on Insulation Levels:

(i) Separate source voltage withstand test. The applied voltage shall be the relevant power frequency voltage specified in the clause on Insulation Levels

(j) Polarisation index test (1 minute and 10 minute). Index shall be not less than 1.5

(i) Magnetic balance test

32.4. Routine Test Sequence

The sequence of tests shall be:

(a) Winding resistance measurement, voltage ratio measurement and vector group check

(b) Separate source voltage withstand test, induced over-voltage withstand test

(c) Impedance voltage and loss measurements

(d) Tap changer test

(e) Tests on auxiliary circuits

The following tests on site will be carried out under a different Contract after plant is fully assembled:

(a) Ratio and vector group checks

(b) Insulation resistance (HV-LV, HV-E, LV-E)

(c) Oil tests

(d) Other necessary pre-commissioning tests

The Supplier will be held responsible for any discrepancy or defect discovered during these tests and shall rectify immediately on receipt of notification. The Supplier may at his own discretion witness site testing of transformers.

32.5. Rejection

The Client may reject the transformer, if during testing and commissioning the following is found:

(a) Load and/or no-load losses exceed the guaranteed value by 15% or more

(b) Total losses exceed the guaranteed values by 10% or more

(c) Impedance differs from the guaranteed value as specified

(d) Transformer fails any test

(e) Any deviation from specification is found not considered acceptable

B2 Ring Main Unit (RMU)

1 Introduction

This document details the whole of life performance requirements for 11kV Ring Main Unit (RMU) type switchgear for use on the Atiu Island proposed 11kV network. All information required to ensure that the switchgear is electrically suitable for the Atiu Island network is contained in this document or referenced by this document.

The RMUs referred to in this standard consist of various combinations of circuit-breaker, switch-fuse combinations and switch-disconnectors, with or without SCADA indication, combined in units and arranged in linear configurations.

This standard does not apply to 11kV switchboards, fitted with SCADA control.

Switch-disconnector functional units, switch-fuse combination functional units and circuit-breaker functional unit configuration requirements are set out for feeder and transformer applications. For circuit-breaker protection, self-powered protection equipment is to be provided and is located with the relevant circuit-breaker.

Specific details of the required protection schemes are not included here and are referenced in an associated document.

2 Scope and Application

2.1 General

This document specifies the characteristics of factory assembled, non-withdrawable switchgear designed for indoor or kiosk installation on distribution systems operating at nominal 11kV AC, three-phase, 50Hz.

The requirement is for RMU's of up to four functional units, non-extendable and suitable for use in a linear configuration.

The equipment specified in this document is not for use where a busbar is to be divided into two or more sections.

Switchgear functional units may be circuit-breakers, switch-fuse combinations or switch-disconnectors. Specific panel configuration requirements are set out for the following applications:

• Network switching (feeder)

• Distribution transformer

The RMU panels will in general include equipment that comprises a switch-disconnector, fixed circuit-breaker or combined switch-fuse, with associated earthing facility, in combination with the associated mechanical operation, indicating, alarm, and protective equipment, including interconnections, accessories, enclosure and supporting structure.

A circuit-breaker will be used for transformers in the size range above 300kVA in lieu of switch-fuse combinations.

Where a circuit-breaker is specified, the protection equipment shall be self-powered and shall be located in or immediately above the relevant circuit-breaker functional unit.

The switchgear is intended for indoor use or outdoor use in an enclosure (kiosk) under ambient conditions. Appropriate derating factors for the installed conditions need to be included in the switchgear design to meet the required specifications.

All equipment shall be supplied complete and operational except as specifically excluded and shall include all necessary accessories and the incorporation of all miscellaneous material, minor parts and other such items, whether or not the items are specified, where it is clearly the intention that they should be supplied or where they are obviously required and necessary for completion, commissioning and future maintenance requirements of the equipment.

2.2 Application

The requirements of this document apply from the date of approval of this standard when a new 11kV indoor/kiosk RMU is to be installed on the Atiu Island proposed 11kV network.

The requirements of this document are not applicable to existing 3.3kV indoor RMU currently in service in the Atiu Island network.

3 Reference Standards

The following documents contain provisions, which, through reference in this text, constitute provisions of this specification.

At the time of publication, the editions indicated were valid.

3.1 International Standards

IEC 61958:2000 High-voltage prefabricated switchgear and control gear assemblies - Voltage presence indicating systems

IEC 62063:1999 High-voltage switchgear and control gear - The use of electronic and associated technologies in auxiliary equipment of switchgear and control gear

IEC 62271–105:2002 High-voltage switchgear and control gear - Part 105: Alternating current switch-fuse combination

IEC 60051-1:1997 Direct acting indicating analogue electrical measuring instruments and their accessories Part 1: Definitions and general requirement common to all parts

IEC 60051-2:1984 Direct acting indicating analogue electrical measuring instruments and their accessories Part 2: Special requirements for ammeters and voltmeters

IEC 60051-7:1984 Direct acting indicating analogue electrical measuring instruments and their accessories Part 7: Special requirements for multi-function instruments

3.2 Australian Standards

AS 62271.100:2005 High Voltage A.C. Switchgear and Control Gear - Part 100 High voltage alternating-current circuit-breakers

AS 62271.102:2005 High voltage A.C. switchgear and control Gear - Part 102 Alternating Current Disconnectors (isolators) and earthing switches

AS 62271.110:2006 High voltage switchgear and control gear - Part 110 Inductive load switching

AS 62271.200 - 2005 High voltage switchgear and control gear - Part 200 AC metal enclosed switchgear and control gear for rated voltages above 1kV and up to and including 52kV

AS 62271.301:2005 High voltage switchgear and control gear - Part 301 Dimensional standard of terminals

AS 1852(441):1985 International Electro technical Vocabulary. Chapter 441: Switchgear, control gear and fuses

AS 1939:1990 Degrees of Protection Provided by Enclosures for Electrical Equipment (IP Code)

AS 2024:1991 High voltage A.C. switchgear and control gear – Switch-fuse combinations

AS 2067:1984 Switchgear assemblies and ancillary equipment for alternating voltages above 1 kV

AS 2629:1983 Separable insulated connectors for power distribution systems above 1kV

AS 2650:2005 Common specifications for high-voltage switchgear and control gear standards

AS 2700:1996 Colour Standards for General Purposes

AS 2791:1996 High voltage A.C. switchgear and control gear – Use and handling of SF6 in high voltage switchgear and control gear

AS 1033.2:1988 High Voltage Fuses (for rated voltages exceeding 1000V) Part 2 – Current-Limiting (powder-filled) type

AS 1265 + Amd 1:1990 Bushings for Alternating Voltages above 1000V

AS 1931.1 & .2:1995 HV testing techniques

AS 60265.1:2001 High-voltage switches - Switches for rated voltages above 1 kV and less than 52 kV

AS 60044.1:2003 Instrument transformers - Current Transformers

AS 3760:2003, Amd 1:2005 In service Safety inspection & testing of electrical equipment

3.3 Atiu Island Standards

Not Applicable

4 Definitions, Terms and Abbreviated Terms

4.1 Definitions and Terms

For the purpose of this specification, the terms, definitions and abbreviated terms in AS 1852.441 and the following apply:

Circuit-breaker A mechanical switching device that is capable of making, carrying and breaking currents under normal circuit conditions, and also of making, carrying for a specified time and breaking currents under specified abnormal conditions, such as those of a short-circuit.

Circuit-breaker functional unit (panel) A switchgear panel complete with a fixed circuit-breaker, switch-disconnector, earthing switch and protection & control equipment.

Disconnector As defined in (AS 1852(441) 441-14-05). A mechanical switching device which provides, in the open position, an isolating distance in accordance with specified requirements.

Note:

A disconnector is capable of opening and closing a circuit when either negligible current is broken or made, or when no significant change in the voltage across the terminals of each of the poles of the disconnector occurs. It is also capable of carrying currents under normal circuit conditions and carrying for a specified time currents under abnormal conditions such as those of short circuit.

Earthing switch As defined in (*AS 1852(441) 441-14-11*).

A mechanical switching device for earthing parts of a circuit, capable of withstanding for a specified time currents under abnormal conditions such as those of short circuit, but not required to carry current under normal conditions of the circuit.

Fixed circuit-breaker A circuit-breaker which is not a withdrawable part of the panel assembly it which it is mounted.

Switch - fuse combination A mechanical switching device fitted with a fixed fuse, that is capable of making, carrying and breaking currents under normal circuit conditions, and also of making, carrying for a specified time and breaking currents under specified abnormal conditions, such as those of a short-circuit.

Switch-Fuse functional unit (panel) A switchgear panel complete with switch-disconnector, a fixed Fuse, earthing switch.

Metal-clad switchgear Metal-enclosed switchgear in which certain components, for example, circuit-breakers, are arranged in separate compartments that have metal partitions and that are intended to be earthed.

Non-withdrawable switchgear Switchgear that contains circuit-breaker and switches, which are not a withdrawable part of the panel assembly in which they are mounted.

Rated insulation level The combination of the rated lightning impulse withstand voltage and the rated short duration power frequency withstand voltage specified in AS 2650.

Rated normal current For main circuits and switching devices, the r.m.s. value of the current that they are designed to carry continuously under the specified conditions of use and behaviour.

Rated peak withstand current For main and earthing circuits, the peak current associated with the first major loop of the short-time withstand current that a mechanical switching device is designed to carry in the closed position under prescribed conditions of use and behaviour.

Rated short-time withstand current For main and earthing circuits, the r.m.s. value of current that the switching device is designed to carry in the closed position during a specified short time under prescribed conditions of use and behaviour.

Rated closed-loop breaking current (AS 6025.1-2001: 4.102) The rated closed-loop breaking current is the maximum closed-loop current the switch shall be capable of breaking. Separate ratings for distribution line loop breaking current and parallel power transformer breaking current may be assigned.

Rated voltage The highest r.m.s. phase-to-phase voltage of the supply on which the switchgear is designed to operate.

Switch A mechanical switching device that is capable of making, carrying and breaking currents under normal circuit conditions, which can include specified operating overload conditions, and also capable of carrying for a specified time, currents under specified abnormal circuit conditions such as those of a short-circuit.

Switch-disconnector As defined in (AS 1852(441) 441-14-12). A switch which, in the open position, satisfies the isolating requirements specified for a disconnector.

Switchgear A general term that covers switching devices and their combination with associated control, measuring, indicating, alarm, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended, in principle, for use in connection with the generation, transmission, distribution and conversion of electric energy.

Switchgear functional unit (or functional panel) Switchgear of modular design that comprises a mechanical switching device, for example, a circuit-breaker, a switch-disconnector, a switch-fuse combination or a switch.

Withdrawable As defined in (*AS 1852(441) 441-13-09*).

4.2 Abbreviated Terms

CT Current Transformer

VT Voltage transformer

RMU Ring Main Unit

5 Background

Atiu Island currently operates a 3.3kV high voltage AC network and a 415V low voltage AC network. As part of the upgrade work, a new 11kV high voltage AC network will be installed.

The proposed Atiu Island 11kV network will supply electricity via transformers to community loads.

6 Functional Characteristics

The 11kV indoor switchgear covered by this standard shall:

• Provide an 11kV busbar

• Provide for connection of 11kV feeders, and distribution transformer circuits to the 11kV busbar

• Provide for isolation and earthing of feeders, and distribution transformer circuits

• Provide protection for distribution transformer circuits

• Provide the means to perform testing on the HV cables, without disconnecting the HV cables from the RMU

• Provide for fault indicators on the switches

Note: There is no requirement to provide a facility to earth the busbar.

7 Performance Characteristics

7.1 General

The RMU shall be designed and manufactured in accordance with following standards:

• *AS 2067, AS 2650, AS 62271 – 100, AS 62271 – 102, AS 62271 – 110, AS 62271 – 200 and AS 62271 – 301.*

Except where specifically varied in this standard the RMU shall have the following characteristics:

Characteristic	**Value**
Number of Phases	3
Nominal System Voltage	11kV non effectively earthed and solid earth
Type	Metal Clad, non-extensible
Installed	Indoors & suitable for use outdoors within a kiosk enclosure
Insulation system	Sealed switchgear system incorporating a corrosion proof steel tank containing busbar and switching devices enclosed in SF6 gas. Switchgear to be designed as a hermetically sealed pressure system in accordance with *AS 2650:2005*. Porcelain shall not be used for interface insulation.
To be fitted. Indicating Green (gas pressure OK), Red (gas pressure low)	30 years
Gas pressure gauge	To be fitted. Indicating Green (gas pressure OK), Red (gas pressure low)
Switch-disconnector	Non withdrawable
Circuit-breakers	Non withdrawable
Switch-fuse	Non withdrawable
Busbar	Single

Table 1 - Switchgear characteristics

The switchboard shall be suitable for the environmental and ambient conditions found within an outdoor kiosk (60ºC).

7.2 Ring Main Unit Ratings

The switchgear shall have the following general ratings:

Rating Type	**Rating**
Rated voltage	Not less than 12 kV
Line to Earth Voltage Rating	Suitable for Resistivity Earthed and Solidly Earthed Systems
Rated frequency	50Hz
Busbar - Rated Normal Current for ambients in accordance with AS 2650	630 A
Fault make, load break switch-disconnector (Feeder) AS 60265.1 class E2/M1 - Rated Normal Current	400 A
Transformer Tee-off Switch-fuse units - Rated Normal Current	200 A
Transformer Tee-off Circuit-breaker units - Rated Normal Current	200 A
Rated Insulation Level:	
Minimum Rated peak lightning impulse withstand voltage common value, Up	95 kV (Peak)
Rated short-duration power-frequency withstand voltage (across the isolating distance), Ud	32kV (rms)
Rated short-duration power-frequency withstand voltage (common value), Ud	28kV (rms)
Rated short-time withstand current, Ik	20 kA (rms)
Rated short time current, earth circuit	10 kA
Rated duration of short-time current, Tk	1 second
Rated Short Circuit Breaking Capacity	20 kA

Rated Short Circuit Making Capacity of switch-disconnectors and earthing switches	40 kA (peak)
Network load and closed-loop breaking current (switch-disconnectors)	400 A
Internal Arc Classification	(As per AS 62271-200, Annex A; Defined 3.132)
AFLR	Internal arc 20 kA, 1 sec

Table 2 - Switchgear Ratings

8 Technical Characteristics

8.1 General

The switchgear shall be self-powered complete with highest level of arc fault containment to the latest Australian Standards suitable for the application within Atiu Island's proposed 11kV network.

Switchgear shall comply with the requirements of *AS 62271-200* and *AS 2650.*

Specifically, the Switchgear shall meet all Internal Arc Classification (IAC) criteria as proven by test in accordance with Annex A of *AS 62271-200*.

For the purpose of this standard, Isolation devices are: Circuit-Breakers, Switch-disconnector, Switch-Fuse combinations.

8.1.1 RMU Configurations

The following are requirements for RMU configurations:

• The switchgear functional units shall be assembled into RMU units of switch-disconnectors, combined switch-fuses and circuit-breaker functional units.

• Circuit-breaker functional units and switch-fuse functional units are for use with distribution transformers.

• Switch-disconnector functional units are for use with feeders. An optional fault indicator maybe fitted to a feeder switch.

• Circuit-breakers with self-powered protection relays shall be used in lieu of switch-fuse combinations for distribution transformers when the transformer is 300kVA or above. The CT's shall comply with *AS 60044.1* and be suitable for prospective fault levels for the Atiu Island proposed 11kV system.

• The switch-fuse shall be suitably rated for the distribution transformer specified for each order and be able to withstand the inrush current of the transformer. The specific fuse size will be nominated at order.

There is no requirement for the assembled RMU to be extendable.

For kiosk installation as nominated in Table 3, overall maximum dimensions are 2400mm Long, 1200mm Wide, 1800mm High. Complete switchgear assembly including all accessories must not exceed these dimensions.

A single RMU shall comprise the following combinations of each function as described in the Table 3 below:

Item #	Configuration of functional units	Total number of functional units	Installation
1	2 x switch-disconnectors (feeders) 1 x switch-fuse (transformer)	1	kiosk
2	4 x switch-disconnectors (feeders)	4	Stand-alone and Indoor

Table 3 – Ring Main Unit Configurations

8.1.2 Live Line Indicators

Live line indicators shall be provided for each of the three phases on each circuit and the busbar. Live line indicators shall comply with the requirements of *IEC 61958*.

8.1.3 Anti-Condensation Heaters

Anti-condensation heaters may be used for ring main units in kiosk applications where no transformer is installed. If anti-condensation heaters are required an external auxiliary supply will be provided.

8.1.4 Gas Insulation

End of life gas recovery must be provided.

The switchgear shall be factory sealed so as to not require any routine gas replenishment during installation or in normal service.

The design, construction and sealing of gas compartments shall be such that the gas will be maintenance free for 25 years.

A green/red indicator for monitoring the SF6 pressure in each gas compartment while in service shall be provided. This device shall provide indication of the minimum permissible pressure level for safe operation. The pressure level monitoring device shall be clearly visible to the operator from the operating side of the switchgear functional unit. Pressure gauge shall have a green indicator area for gas pressure OK and red indicator area for gas pressure low.

8.1.5 Earthing Bar(s)

To assist with stray current mitigation measures from the DC traction system, it may be necessary to connect 11kV cable screens to a separate cable screen earth bar. This arrangement is to facilitate future installation of a transient earth clamp.

The transient clamp acts as a DC de-coupler, to provide DC isolation between earthing points that are still AC connected. Under an AC earth fault the clamp impedance momentarily changes state to a virtual short circuit, acting to provide a direct connection of HV cable screens to the switchboard earth bar. The transient earth clamp provides a blocking path to DC stray current that could otherwise use the cable screen as a path.

Note some HV panels and HV functional units will require all HV earth screens to be directly connected to the switchboard earth bar.

Each feeder functional unit shall include two copper earthing bars, rated for maximum fault levels and not less than 120mm2 cross section area to facilitate earthing.

A separate cable screen earth bar shall be provided for each feeder functional unit. This shall be connected to the switchboard earth bar via removable links and shall be isolated from similar bars in adjacent functional units. It shall be insulated from the frame of the switchboard by insulated mounts that have been rated for maximum earth potential rise and tested to 15kV for not less than 1 minute. The cable screen earth bar shall provide for connection of the two removable links, four HV cable screens and mounting holes for a transient earth clamp.

The **ring main unit earth bar** shall interconnect adjacent switchgear functional units and provide:

- for all switchgear bonding
- for two cable connections to the main substation earth grid
- for two removable links per functional unit for connection to the insulated cable screen earthing bar.
- for connection of four HV cable screens
- mounting holes for a transient earth clamp

To provide for mounting of the transient earth clamp to the two earth bars, i.e. the ring main unit earth bar and the cable screen earth bar, shall be vertically separated as far as possible to provide sufficient space for future insertion of the transient earth clamps.

8.1.6 HV Cable Interface

Each circuit-breaker, switch-disconnector and switch-fuse combination, functional unit shall be equipped with a HV cable compartment providing a dead-break, separable, fully insulated and shielded system for connection of HV cables. The separable insulated shielded connection system is to be compliant with *AS 2629* and relevant ratings specified in Section 7.

The HV cable compartment shall be suitable for connection of single and 3 core XLPE insulated 11kV cables up to a maximum size of 150mm^2.

Feeder and circuit-breaker units are to use Elastimold, bolted, field disconnectable type 400TB (or equivalent to be approved by the Client).

Switch-fuse units are to use Elastimold type 158LR (or equivalent to be approved by the Client).

The cables shall enter the cable compartment from below. Details of the cable connections shall be nominated in the Technical Schedule at Appendix A.

The cable termination shall be capable of withstanding the power frequency test as specified in Table 1 of *AS 2650*.

8.1.7 Surge Arresters

The switchgear may be installed with short cable feeds from overhead lines.

Sufficient space shall be provided within the cable compartment of each feeder cubicle to install surge diverters if required for the specific feeding configuration.

Surge arrester type and restrictions shall be nominated in the Technical Schedule at Appendix A.

8.1.8 Auxiliary Equipment

Each switchgear functional unit (switch-disconnector, switch-fuse, circuit-breaker) shall be fitted with:

- Two normally open and two normally closed auxiliary switches. The rating shall be as described in Section 8.10.2. (These auxiliary switches shall be provided in addition to those essential to the circuit-breaker operation).
- A set of terminals for the termination of auxiliary wiring associated with the auxiliary switches, fault indicators, fuse blown or transformer protection relay outputs shall be provided.

8.2 Circuit-Breaker Functional Unit

N/A

8.3 Switch-Fuse Functional Unit

8.3.1 General

Switch-fuse combinations shall be used for protection of transformers when the transformer is below 300kVA in size.

Switch-fuse combination functional units shall comprise a fixed switch-disconnector, a fuse and interlocked earthing switches. The fuses are to be easily accessible through the front and interlocked with the earth switch.

Switch-fuse combinations shall comply with the requirements of *AS 2650* and *IEC 62271 – 105* and *AS 2024:1991*.

Switch-disconnectors and earthing switches that have long mechanical and electrical endurance (as defined in *AS 62271* parts 100 & 102) are preferred.

The fuses shall comply with *AS1033.2:1988*. The fuse holder and fuse shall be suitable for the prospective fault rating. The fuse holder shall suffer no degradation following rated fault currents with rated duration times.

Fuse blown indication is to be provided. Voltage free auxiliary contacts are to be wired to terminals for remote indication purposes – see Section 8.1.8.

If any one fuse ruptures the switch-disconnector shall open all three phases immediately.

Earthing is to be made simultaneously on both sides of the fuselink where applicable.

There is no requirement for motorised operation of switch-fuse disconnectors when used in RMU configurations.

8.3.2 Switch-disconnector Type

The interrupting medium shall be either vacuum or SF6.

The Switch-disconnector used in the switch-fuse combination shall comply with Section 8.4 of this document.

8.3.3 Switch-Fuse Combination Operating Mechanisms

Each switch-fuse disconnector shall consist of three separate "pole units" mounted on a single piece frame and shall be mechanically interconnected.

Three separately mounted fuses shall be mounted after the switch disconnect unit. An earth switch unit shall be mounted after the fuse between the cable and the fuse. The earth switch shall be mechanically interlocked with the switch-disconnector earth position.

Any part of the switch mechanism that requires routine inspection and maintenance shall not be enclosed in any gas tight compartment.

8.4 Switch-disconnector Functional Unit

8.4.1 General

Switch-disconnector functional units shall comprise a switch-disconnector and interlocked earthing switch. Switch-disconnectors shall comply with the requirements of AS 2650 and *IEC 62271 – 102*. There is no requirement for motorised operation of switch-disconnectors when used in RMU configurations.

8.4.2 Switch-disconnector Type

The interrupting medium shall be either vacuum or SF6.

8.4.2.1 SF6 Switch-disconnector

Each switch-disconnector shall consist of three separate "pole units" mounted on a single piece frame and shall be mechanically interconnected.

8.4.3 Switch-disconnector Operating Mechanisms

Any part of the switch-disconnector mechanism that requires routine inspection and maintenance shall not be enclosed in any gas tight compartment.

The switch-disconnector shall be manually operated for opening and closing.

8.5 Indications

8.5.1 Circuit-breaker Functional Unit

N/A

8.5.2 Switch-disconnector Functional Unit

Switch-disconnector functional units shall have indication clearly visible from the front of the functional unit. The following definite indications shall be provided:

a) Switch-disconnector open/close

b) Earth switch position

8.5.3 Switch-Fuse Functional Unit

Switch-fuse combination functional unit shall have indication clearly visible from the front of the functional unit. The following definite in1dications shall be provided:

a) Switch-disconnector open/close

b) Earth switch position

c) Fuse blown

8.6 Interlocks

Facilities provided for operational access to parts of the switchgear functional unit that contain live components shall be mechanically interlocked so that access to such parts is not possible unless all live parts have been rendered safe, either by an applied earth connection or by being positively disconnected and screened from the remaining live parts.

Mechanical interlocks shall be provided to ensure positive and substantial protection against malfunction, and shall be so designed and constructed as to ensure dependable fail-safe operation.

Mechanical interlocks shall be provided in compliance with Section 5.11 of *AS 62271-200* to prevent unsafe operation, including:

- Automatic opening of a circuit-breaker when it is used to earth a circuit or the bus bar
- Closing of an earthing switch unless the circuit-breaker is in the open position
- Opening or closing a switch-disconnector associated with a circuit-breaker unless the circuit-breaker is open
- Closing the cable earth switch while the associated switch-disconnector is closed

Positive mechanical interlocking shall be provided to prevent inadvertent switching from the ON position to the EARTH position without a definite stop in the OFF position, or from the EARTH position to the ON position without a definite stop in the OFF position.

Access to the test terminals shall only be possible when the associated earth switch is in the EARTH position.

When the circuit test facility is in use, it shall not be possible to close the disconnector.

It is preferred that the making of the disconnector contacts in the EARTH position shall be directly observable by the operator.

If the earthing of a circuit-breaker or switch-fuse combination or switch-disconnector functional unit is not visible from the operating position, the corresponding indication shall be directly coupled to the earthing mechanism, to ensure fail-safe indication.

An analysis shall be provided detailing the integrity of the interlocking system. The analysis shall include all possible failure modes and the controls employed to prevent an unsafe operation.

A table shall be produced of all possible and inhibited states the switchgear may occupy.

8.7 Circuit Earthing Facilities

Each functional unit shall be equipped with circuit earthing switches manufactured and tested in accordance with *IEC 62271-102*.

Earth switches shall be the integral type.

The earthing system shall be designed and tested for making a live circuit with a prospective peak fault current as specified in Table 2 of this standard. Each circuit-earthing switch shall be mechanically interlocked with the corresponding isolation device in accordance with Section 8.6 of this specification.

The earth switches associated with switch-disconnectors for feeders shall be fault making.

The earthing switch associated with transformer circuit-breakers or switch-fuses shall be rated for fault making if there is any identified failure mode, which could result in the earth switch being closed onto a live circuit.

Each switch shall be provided with a failsafe-indicating device to positively indicate whether it is in the OPEN OR EARTH position and the words "OPEN" and "EARTH" shall be used for the respective indication of these positions.

If the equipment is configured to allow the position of the disconnector contacts in the EARTH position to be directly observable, then appropriate illumination shall be provided.

8.8 Padlocking

Facilities shall be provided to padlock:

- The circuit-breaker in the open position and the closed position while the disconnector is in the earthed position, and the disconnector in the closed, open and earth positions
- The switch-fuse combination in the open position and the earth position while the cable earth switch is in the earthed position and the closed position while the cable earth switch is not in the earth position
- The switch-disconnector in the closed, opened and earth positions
- The disconnector in the closed, opened and earth positions
- The circuit test facility, if applicable (see Section 8.6 and 8.11)

All padlocking facilities shall be suitable for padlocks with a 4/6mm shank diameter.

8.9 Fault Indicators

All RMU feeder switch units shall be equipped to interface with a Merlin Gerin Flair 22D fault indicator or equivalent.

This fault indicator is optional and will be specified with placement of order. The wiring (for SCADA indication interface and remote reset) is to be fitted to all units.

8.10 SCADA Indications and Controls

N/A

8.11 Circuit Test Facilities

Each functional unit shall incorporate an integral type circuit test facility.

All test facilities shall be suitable for the application of 25kV DC test voltage associated with the after-installation testing of power cables, and shall be rated for the same system voltage as the switchgear.

The test facility shall facilitate the connection of test equipment with the circuit earthed and then allow the earths to be removed with the test equipment still connected.

It shall be possible to connect a hand applied earthing set to the circuit side of each circuit-breaker functional unit, switch-fuse combination functional unit and switch-disconnector functional unit for use in conjunction with test equipment. It shall be possible to apply or remove the earth connection independent of the application or removal of the test equipment connection. It is permissible that external removable accessories be used to achieve this function.

9 Integrated System Support Requirements

9.1 Integrated Support Objectives

The switchgear manufacturer must establish and provide the information required to operate and maintain the equipment throughout its operational life, in a cost effective manner and to a level that is consistent with the planned operational performance and usage of the switchgear.

This includes:

- Specifying Maintenance Requirements
- Spares Support
- Operations and Maintenance Manuals
- Training and
- Support Equipment and Tooling

9.2 Equipment Supplier Deliverable

The Integrated support requirements are a significant deliverable in the procurement of new Switchgear. Manuals, training, documentation and other support deliverables.

9.3 Maintenance Concept

In the event of major failure it is anticipated that the entire ring main unit would be replaced.

10 Tests

Testing requirements are to be read in conjunction with other relevant specifications, where appropriate.

10.1 Routine tests

Routine tests as listed in:

AS 2650, Section 7
IEC 62271-100, Section 7
IEC 62271-200, Section 7

shall be carried out.

10.2 Type tests

The results of type tests as required in:

AS 2650
IEC 62271-100

IEC 62271-200

shall be made available by the supplier upon request.

Test certificate details, demonstrating compliance with the above standards, including the date, results and name of the testing body shall be supplied in the Technical Schedule at Appendix A.

Type test certificates for each of these tests will be accepted where it can be demonstrated that the switchgear supplied is of a similar design to previously type tested switchgear.

11 Data Set associated with the Equipment

The following data shall be supplied by the manufacturer and maintained for the switchgear. This data will remain the property of Atiu Island and Office of the Prime Minister.

11.1 Information

Information requirements are to be read in conjunction with other relevant specifications.

11.2 Technical Schedule at Appendix A

The information listed in the technical schedule at Appendix A, supplied by the manufacturer, shall be provided for each RMU.

11.3 Life Cycle Costing

N/A

B3 Scope of Works

1. Tenderers must allow all costs associated with the manufacture, supply and deliver CIF to Rarotonga all HV electrical equipment for the APU Project.
2. The equipment are namely:

    a) Tropicalized kiosk/minipad complete with the following:
        - Step-up YNd1 transformer complete with:
            - HV fusing (correctly sized)
            - HV cabling between transformer and RMU bushings (installed)
            - Filled with oil
            - Off-load tap changer
        - Safelink2 3-way CCF SF6 HV outdoor RMU complete with:
            - Remote fault indicators on C switches
            - Operating handle
            - Cable testing feature
            - Gland plates
        - Low-voltage switchgear consisting of:
            - Formica panel
            - 250A 3-pole isolator
            - MCCB chassis
            - 250A MCCB with 200A thermal magnetic overload
            - 100A MCCB with 63A thermal magnetic overload
            - Earth & Neutral busbars with M10 studs

    b) Stand-alone Safelink2 4-way CCCC SF6 HV indoor RMU complete with:
        - Remote fault indicators on C switches
        - Operating handle
        - Cable testing feature
        - Gland plates

APPENDIX C – Evaluation Criteria

The Evaluation Criteria has been drawn from the Statement of Requirements, Standard Conditions and Special Conditions as articulated in the RFT. In accordance with Clause 4.7.5 of the CIGov FPP Manual, Tenders that do not meet the Standard Conditions are deemed non-compliant.

C1 Standard Conditions

Criteria	Compliant (yes or no)
1. Tender was deposited in the Tender Box by the closing time specified in the RFT	
2. Tender is complete with contents and format contained in Appendix A of the RFT has been followed	
3. Proposal and related documentation was submitted in the English language	
4. Tenderer has tendered to complete the whole of the works specified in the RFT	

C2 Special Conditions

The weighted criteria methodology will be applied to this RFT to identify the Tenderer who is offering the maximum value for money.

Only fully compliant Tenders will be evaluated. A Tender Evaluation Committee ("TEC") will be established to evaluate the Tenders. Expert advisors may be used to support and advise the TEC during the evaluation process. Tenderers may also be required to provide additional information during this time.

The TEC will make recommendations to the CIGov Tender Committee (TC), consisting of the MFEM Financial Secretary and the Solicitor General, and also seek for their approval.

Evaluations will be conducted against the attributes outlined in the table below.

Attribute	Score Weighting
Non-Price attributes	
1. Technical Compliance • Does not meet the minimum requirements (5) • Meets the minimum requirements (30) • Exceeds the minimum requirements (50)	50
2. Delivery Schedule • More than 4 months (4) • 4 months (7) • Less than 4 months (10)	10
3. Local content • None (1) • Partial (6) • Full (10)	10
Total Non-Price attributes	70
4. Price	30
Total Price attribute	30
TOTAL SCORE WEIGHTING	**100**

C3 Risk Evaluation

The TEC will conduct a Risk Assessment for each tender submitted. This will identify the most significant risks presented by the Tenderer and consider the Likelihood of the risk occurring; the consequence of that risk; and a risk mitigation strategy. In conclusion, the mitigated risks will be determined to form an overall measure of the risks represented by each tender.

The Risk Mitigation Strategy may include the inclusion of specific clauses in the executed Agreement/Purchase Order. Therefore, a tender considered to be high risk may still be selected subject to the Tenderer's willingness to accept the proposed Agreement/Purchase Order amendments.

APPENDIX D – DRAFT PURCHASE ORDER

PURCHASE ORDER

Government: Her Majesty the Queen acting by and though the Office of the Prime Minister

Signed: _____

Name: Elizabeth Wright

Position: Chief of Staff

Date: _____

Supplier: _____

Signed: _____

Name: _____

Position: _____

Date: _____

Product and Services: Supply and deliver high voltage equipment (kiosk containing 200kVA step-up transformer, 3-way CCF high voltage ring main unit and low voltage switchgear and stand-alone 4-way high voltage CCCC ring main unit) for the Atiu Island Power Upgrade Project

Delivery: Cost, Insurance and Freight (CIF) to the Port of Rarotonga, Cook Islands within 4 calendar months from Agreement/Purchase Order signing

Total Purchase Price: NZ$_____ excluding VAT

_____

_____

_____

(in words, excluding VAT)

Payment will be made in two (2) instalments:

a) The first instalment, equal to 75% of the total Price, is payable within five (5) Working Days of executing the Terms and Conditions, provided an accurate tax invoice has been received by the Cook Islands Government.

b) The second and final instalment, equal to 25% of the total Price, is payable within ten (10) Working Days of the equipment being inspected and/or accepted by the appropriate Cook Islands Government agency or personnel, provided an accurate tax invoice has been received by the Cook Islands Government.

Insurance: The Supplier shall provide full Public Liability Insurance cover that provides indemnity for legal liability to pay compensation for personal injury or property damage sustained by a third party which resulted from the policyholder's negligence.

Contact Person: Cook Islands Government Contact: Ngateina Rani (Project Engineer)

Supplier Contact: _____

Additional Terms

Rejection: In addition to the reason to reject the equipment in clause 5.7 of the Terms and Conditions, the Cook Islands Government may also reject any equipment where:

(a) Load and/or no-load losses exceed the guaranteed value by 15% or more;

(b) Total losses exceed the guaranteed values by 10% or more;

(c) Impedance differs from the guaranteed value as specified;

(d) Transformer or Ring Main Unit fails any test; and

(e) Any deviation from specification is found not considered acceptable.

Liquidated Damages: If the Supplier fails to complete the works in accordance with the Terms and Conditions within the time fixed or any agreed or permitted extension of time, then without prejudice to and notwithstanding the exercise of any right of the Government to terminate the Terms and Conditions, liquidated damages shall be payable at the rate of 0.5% of total Price (including VAT), for each day of the delay.

Special Requirements

Standards: The equipment shall be designed, manufactured and tested in accordance with the latest editions of the standards as stipulated in the Appendix B/B1/Part 1/Section 2 and B2/Part 1/Section 3 of the specification.

Specification: The equipment shall comply in all respects with the requirements of the specification.

Non-Conforming: The Cook Islands Government shall retain responsibility for decisions regarding acceptance, modification or rejection of non-conforming equipment.

Testing: All equipment shall successfully pass all type and routine tests referred to in this specification and those listed in the most recent edition of the standards mentioned in the specification.

Condition: All equipment must be new and never been used on the field other than testing in the factory.

APPENDIX E – Terms and Conditions for Supply of Product and Services

Attached as a separate file.