FIJI ELECTRICITY AUTHORITY

MR 222/2017

Vuda Power Station

Upgrade of the Vuda G1 and G2

Amot Control Panels and Associated Control System

Note;

This tender should be a separate Tender and should not merged with the Vuda Power Station Tender MR 221/2017.

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GENERAL CONDITIONS OF CONTRACT

1.0 DEFINITIONS

In this contract, the following terms shall be interpreted as indicated: -

1.1 "Authority" or "Purchaser" means the Fiji Electricity Authority.

1.2 "Contract" means the agreement entered between the Authority and the Contractor as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.3 "Contract Price" means the price payable to the Contractor under the Contract for the full and proper performance of its contractual obligations.

1.4 "Goods" means all the equipment, which the Contractor is required to supply to the Authority under the Contract.

1.5 "Contractor" means the individual or firm carrying out works as defined under Scope of Works.

1.6 "Site" means the place where the equipment will be installed, as stated in the Schedules.

1.7 "Engineer" means the General Manager Generation of the Authority or his representative authorised in writing by him.

2.0 APPLICATION

These General Conditions shall have effect, subject to any express stipulation or condition at variance with these conditions that may be contained in the specification or may otherwise be incorporated in the contract.

3.0 STANDARDS

The Goods supplied under this Contract shall conform to international ISO / DIN standards for mechanical and IEC standards for electrical work.

4.0 CONTRACT AGREEMENT

Notwithstanding the formation of the contract by the Authority's acceptance of the Contractor's tender in writing, the Contractor and the Authority shall, within 30 days of such acceptance, enter into and execute a Contract Agreement.

5.0 PERFORMANCE BOND

5.1 Within 21 days after the Contractor's receipt of notification of award of the contract or upon contract signing and down payment, the Contractor shall furnish a performance bond to the Authority in the amount of 10% of the tendered price.

5.2 The proceeds of the performance bond shall be payable to the Authority as compensation for any loss resulting from the Contractor's failure to complete its performance obligations under the Contract.

5.3 The performance bond shall be denominated in the currency of the Contract or in another freely convertible currency acceptable to the Authority, and shall be in one of the following forms:

a) A performance bond issued by a surety acceptable to the Authority, and in the form provided in the Tender Documents.

b) A Bank Guarantee issued by a bank located in the Authority's country or abroad acceptable to the Authority, and in the form provided in the Tender Documents.

c) A cashier's cheque, certified cheque, irrevocable letter of Credit or Cash.

5.4 The Performance Bond will be discharged by the Authority not later than 90 days following the date of completion of the Contractor's performance obligations, including any warranty obligations under the Contract.

6.0 PROGRAMME TO BE FURNISHED

Within 20 days of the acceptance of his tender the Contractor shall submit to the Authority, for approval, a programme showing the order in which he proposes to carry out the works, including design, manufacture and delivery.

7.0 INSPECTION AND TESTS

The Authority's Engineer or his representative shall have the right to inspect and/or to witness test the Goods at the factory or place of manufacture, for their conformity to the Contract Specifications. The Authority shall notify the Contractor in writing of the identity of its Engineer(s) or representative(s) retained for these purposes. The contractor shall provide the authority with a detailed program for the inspections and/or witness tests and notice of at least 3 weeks of notice when the materials, equipment, system shall be ready for inspection & testing. Nothing in this clause shall in any way release the Contractor from any warranty or other obligations under this Contract in delivering a fully functional plant as specified elsewhere in this document or the contractors' design and specifications.

8.0 PACKING

8.1 The Contractor shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to Fiji. Each component or item shall be suitably packaged & sealed to withstand tropical weather conditions. The packing shall be sufficient to withstand, rough handling during transit and exposure to extreme temperatures, salt, high humidity and precipitation during transit and open storage.

8.2 The packing, labelling and documentation within and outside the package shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, in any subsequent instructions ordered by the Authority.

8.3 Nothing in this clause and the contract documents shall in any way release the Contractor from any warranty or other obligations under this Contract in case of deterioration or damage until the entire plant and facility has been certified as complete by the Authority.

9.0 INSURANCE

The contractor shall provide for 100% insurance cover for the equipment supply, transport and contractor's personnel, including third-party liabilities and Contractors All Risk (CAR) insurance for the equipment scope and consequential damage insurance to existing facilities due to contractor activity/negligence. They shall include the Authority and their representatives as co-insured and hold them harmless from all liabilities and claims.

10.0 DELIVERY

Delivery for the complete Scope of Supply (Goods) shall be Delivered CIF to Lautoka Port complete with all required auxiliary and ancillary equipment.

11.0 TRANSPORTATION

The Contractor is required under the Contract to deliver the Goods (complete equipment scope) Delivered CIF, to the Lautoka Dock , Lautoka, Fiji Islands. Costs associated with carriage and risk thereof shall be included in the Contract Price. Normal Port of Entry shall be Lautoka. The Bidder is also required to include transportation Cost of Equipment from Lautoka Port to Vuda Power Station in their Tender bids.

12.0 PAYMENT

Payment shall be on a percentage of completion basis up to 90% of contract sum till initial commissioning date, 5% retention till successful completion of site tests and final 5% retention after warranty period expires. Payment will be net 10 working days after receipt of invoice-milestone of completion against a mutually agreeable irrevocable Letter of Credit.

12.1 The Contractor's request for payment shall be made to the Authority in writing, accompanied by invoice(s) describing as appropriate, the Goods delivered and services performed together with shipping and other documents as may be required by the Authority. Payments shall be made promptly within ten (10) days, but no later than thirty (30) days of submission of an invoice/claim made by the Contractor, upon approval of the invoice.

12.2 In case there is any dispute on the percentage completion or the amount of work accomplished, the authority shall inform the contractor within 10 days for revision of the invoice.

13.0 PRICES

Prices charged by the Contractor for Goods delivered under the Contract shall not, with the exception of any price adjustments authorised under Clause 14, vary from the prices quoted by the Contractor in his bid. Contractor shall note that no price variation shall be effective unless and until it has been approved by the Authority in writing.

14.0 CHANGE ORDERS

14.1 The Authority may at any time, by written order given to the Contractor, make changes within the general scope of the Contract any one or more of the following :

a) Drawings, Designs or Specifications.

b) Where the goods that are to be furnished under the Contract needs to be modified by the Authority.

c) The method of shipment or packing.

d) The place of delivery.

14.2 If any such change causes an increase or decrease in the cost of, or the time required for the Contractor's performance of any part of the work under the Contract Price or Delivery Schedule, or

both, the Contract shall accordingly be amended. Any claim by the Contractor for adjustment under this Clause must be issued to the Authority within thirty days from the date of the Contractor's receipt of the Authority's change order.

15.0 DELAYS IN THE SUPPLIER'S PERFORMANCE

15.1 Delivery of the Goods, installation & commissioning shall be made by the Contractor in accordance with time schedule specified by the Contractor in his tender. The preliminary schedule provided in the tender shall form the basis of the detailed program as indicated in item # 6.

15.2 An unexecuted prolonged delay by the Contractor in the performance of his delivery obligations shall render the Contractor liable for any or all of the following sanctions, damages, forfeiture of its performance security, and/or termination of the Contract for default.

15.3 If at any time during the performance of the Contract, the Contractor should encounter conditions impacting timely performance of the work. The Contractor shall immediately notify the Authority in writing of any delays, its likely duration and its cause(s). As soon as practicable after receipt of the Contractor's notice, the Authority shall evaluate the Contractor's case and determine if an extension in time for performance of the contract is justifiable. Any extension granted shall be ratified by both parties by an amendment to the Contract. Unless the extension and changes in performance has been duly authorized by the Authority in writing, the delay shall be at the Contractors risk.

16.0 TERMINATION FOR DEFAULT

16.1 The Authority may, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the Contractor, terminate this Contract on the following grounds :

a) If the Contractor fails to deliver any or all of the Goods within the time period(s) specified in the Contract, or any extension thereof granted by the Authority.

b) Fails to perform any other obligation(s) under the Contract.

c) If the Contractor fails to comply within a period of ten days (or any such period as the Authority may authorise in writing) after receipt of default notice from the Authority.

17.0 FORCE MAJEURE

Notwithstanding the provisions of Clause 15 & 16 the Contractor shall not be liable for forfeiture of its performance security, liquidated damages or termination for default if, and to the extent that, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure

In this Clause *Force Majeure* means any event or circumstance (whether arising from natural causes, human agency or otherwise) beyond the control of the Contractor including (in so far as beyond such control but without prejudice to the generality of the foregoing expression) strikes, lockouts or other labour disputes, riot, civil commotion, aircraft fire, flood, drought loss, delay at sea, breakdown or war.

18.0 LANGUAGE

The Contract shall be written in the English language. Subject to Clause 19, the language version of the Contract shall govern its interpretation. All literature, corresponding and other documents pertaining to the Contract which are exchanged by the parties shall be written in that same language.

19.0 APPLICABLE LAW

The Contract shall be interpreted in accordance with the laws of Fiji.

20.0 ARBITRATION

All questions or differences what so ever which may at any time hereafter arise between the parties hereto or their respective representatives attached to this agreement or the subject matter or construction hereof or the rights and duties of the parties hereunder, shall be referred to a single arbitrator if the parties agree or otherwise, to four arbitrators, one to be appointed by each party and in either case, in accordance with and subject to the provisions of the Arbitration Act Cap. 38 of the Laws of Fiji or of any statutory modification or re-enactment thereof for the time being in force. Such person to be an arbitrator will be nominated by the Fiji Institute of Engineers.

21.0 NOTICES

21.1 Any notice given by one party to the other, pursuant to this Contract shall be sent in writing or facsimile to the address specified for that purpose in the Contract.

21.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

22.0 ACCEPTANCE OR REJECTION OF TENDER

The Authority shall not be bound to accept the lowest or any tender nor assign any reason for the rejection of a tender and reserves the right to waive any formality in the tender.

23.0 WARRANTY

23.1 The Contractor warrants that all Goods supplied, installed and commissioned under this Contract shall have no defect arising from material used, workmanship or from any act or omission of the Contractor, that may develop under normal use of the supplied Goods in the conditions prevailing in the country of final destination.

23.2 The Contractor shall clearly specify the Warranty period of the installed and commissioned Goods supplied under this contract and such period shall be referred to as the Warranty and shall not be any period less than 12 months from the date of commissioning (Formal or Official acceptance of the completed installation by the Authority). The contractor shall ensure that the equipment supplied under this Contract shall operate within specified guaranteed performance levels during the warranty period.

23.3 The Authority shall promptly notify the Contractor in writing of any claims arising under this Warranty. Upon receipt of such notice, the Contractor shall, with all reasonable speed, repair or replace the defective Goods or parts thereof, including transport, duty, and local Fiji charges, without any cost to the Authority.

24 GENERAL CONDITIONS`

General conditions of this contract shall be governed by the Built & Turnkey of the Federation Internationale Des Ingenieurs Conseil (FIDIC), Green Book. (Copies can be obtained from FIDIC PO Box 86 CH 1000 Lausenne, 12 Switzerland. Fax 41-21-653 5432)

PART 1 INFORMATION TO TENDERERS

1. NAME AND ADDRESS OF PURCHASER

Fiji Electricity Authority
Private Mail Bag
Suva
FIJI

2. SCOPE OF WORKS

Refer to part section 2 in part 4 - technical specifications.

3. CONDITIONS OF CONTRACT

The conditions of Contract included with this tender document in conjunction with General Conditions of Contract apply to this contract.

4. TENDER DOCUMENTS

I) Tender documents comprises of :

a) General Conditions of Contract

b) Information to tenderers

c) Condition of Tendering

d) Specifications

e) Schedules

f) Form of Tender

g) Price Schedule

5. CLOSING DATE OF TENDERS

The tender closes at **4.00 pm on Wednesday, 20th September 2017.**

6. ADDRESSEE AND ADDRESS FOR POSTED TENDERS

The Secretary - Tender Committee
Fiji Electricity Authority
Private Mail Bag
Suva
FIJI

7. ADDRESS AND PLACE OF DELIVERY FOR TENDERS

The Secretary - Tender Committee
Fiji Electricity Authority
Head Office
Suva, FIJI

DRAFT FORM OF AGREEMENT
(Not to be completed with the Tender)

THIS AGREEMENT made the.....day of.....2015... BETWEEN the FIJI ELECTRICITY AUTHORITY of Private Mail Bag, Suva, FIJI (hereunder called "the Authority") of the one part, AND..... of..... (hereunder called "the Contractor") of the other part.

WHEREAS the Authority is desirous that certain work should be provided and executed, viz. Design, supply delivery, installation, site testing and commissioning of 1 (one) only Main 415V Switch board for Wailoa Power Station and has accepted a Tender by the Contractor for the provision execution and supply of such works.

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of the Contract.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, namely :

    a) The said Tender
    b) The letter of Acceptance of Tender
    c) The Conditions of Contract
    d) The Specifications, Schedules and Drawings including any amendments, clarifications issued until the close of the tender.
    e) The Form of Tender
    f) Any variations to any of the above that has been agreed by the Authority and the Contractor.

3. In consideration of the payments to be made by the Authority to the Contractor, the Contractor hereby covenants with the Authority to provide, execute, complete and maintain the works in conformity in all respects with the provisions of the Contract.

4. The Authority hereby covenants to pay the Contractor in consideration of the provision, execution, completion and maintenance of the Works at the Contract Price at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have cause their respective Common Seals to be hereunto affixed (or have hereunto set their respective hands and seals) the day and year first above written.

The Common Seal of
was hereunto affixed in the presence of :
or
Signed Sealed and Delivered by the said
in the presence of :

FIJI ELECTRICITY AUTHORITY
Main 415V Switchboard for Wailoa Power Station
(**Note**: Tenderers are not required to fill in this form)

FORM OF PERFORMANCE BOND

BY THIS BOND We,.....
whose principal place of business (registered office) is at .....
(hereinafter called "the Contractor") and .....whose principal place of business (registered office) is at .....
(hereafter called "the Sureties") are held and firmly bound unto the FIJI ELECTRICITY AUTHORITY a statutory body established under the provisions of the Electricity Act Cap 180 (hereinafter called "The Authority") in the sum of.....
(.....) for payment of which sum the Contractor and the Sureties bind themselves and their assigns jointly and severally by these presents.

Sealed with our respective seals and dated this ..... day of .....2015..

WHEREAS the Contractor by an Agreement made between the Authority of the one part and the Contractor of the other part has entered into a Contract (hereinafter called "the said Contract") to design, supply deliver, install, site test and commissioning of 1 (one) only Main 415V Switchboard for Wailoa Power Station, has accepted a Tender by the Contractor for the provision execution and supply of such works.

NOW THE CONDITION of the above written Bond is such that if the Contractor shall duly perform and observe all the terms, provision, conditions stipulated in the said Contract on the Contractor's part to be performed and observed according to the true purport intent and meaning thereof or if on default by the Contractor the Sureties shall satisfy and discharge the damages sustained by the Authority thereby up to the amount of the above written Bond, then this obligation shall be null and void but otherwise shall be and remain in full force and effect but no alteration in terms of the said Contract or in the extent or nature of the Works thereunder or in respect of the obligations to correct defects thereunder and no allowance of time by the Authority under the said Contract nor any forbearance or forgiveness in or in respect of any matter or thing concerning the said Contract on the part of the Authority shall in any way release the Sureties from any liability under the above written Bond.
Provided always that the above obligation of the Sureties to satisfy and discharge the damages sustained by the Authority shall arise only under one or both of the following :

a) on written notice from both the Authority and the Contractor that the Authority and the Contractor have mutually agreed that the amount of damages concerned is payable to the Authority and such damages shall have been paid to the Authority.

b) on receipt of the Sureties of a legally certified copy of an award issued in arbitration proceedings carried out in conformity with the terms of the said Contract that the amount of the damages is payable to the Authority, and such damages awarded shall have been paid to the Authority.

The Common Seal of ....
.....
was hereunto affixed in the presence of :

Signature : .....
Position : .....
Address : .. ..
.....

The Common Seal of .....
.....
.....
was hereunto affixed in the presence of :

Signature : .....
Position : .....
Address : .....
.....

PART 2 **CONDITIONS OF TENDERING**

For the Design, supply, delivery, commissioning and provide the necessary warranties and guarantees for a safe and long-term reliable operation of Two (2) x Diesel Mirrlees Engine Control System with panels complete with associated required accessories as per specification, for Fiji Electricity Authority.

1. TENDER DOCUMENTS

I) One set of the Tender is provided electronically to prospective tenderers and further copies of the documents will be provided by the Authority on request in writing from Tenderers.

ii) Tenders are to be submitted in the standard form of Tender provided and are to be accompanied by the full Tender documents with all Schedules duly completed together with all additional information and drawings required by the Specification. In addition to all information which the specification requires to be included with the Tender, Tenderers may also include any additional information which they consider necessary to explain and support their tender.

iii) Where a Tenderer wishes to submit a Tender which significantly deviates from this specification, he shall submit one tender which conforms with the Tender documents marked "Original Tender", together with other tenders as the Tenderer may wish to submit marked "Alternative Tender No.....". Each alternative Tender shall describe clearly the manner and extent to which it departs from the conforming Tender.

v) All Tenders are to remain open for acceptance for a period of 90 days from the date on closing of tender.

2. LODGEMENT OF TENDERS

2.1 Tender submitted shall be complete in every respect including Tenderer's drawings and any technical literature the Tenderer may wish to submit to explain his proposal. Where a Tenderer wishes to submit a conforming tender and an alternate tender(s), the conforming tender shall be clearly marked "Original" and the non conforming, "Alternate Tender".

2.2 All tender documents are to be sent to the Secretary Tender Committee through the website:

www.evalua.com.au/fea

2.3 Any tender received after the stipulated bid closing date and time will be returned unopened to the Tenderer.

3. TENDER PRICES

For the purpose of comparison, the tender prices shall be converted into Fijian Currency at the exchange rates prevailing as of the date of opening of Tenders.

4. All tenders will be opened at the Head Office of the Fiji Electricity Authority, 2 Marlow Street, Suva at **1400 hours 21/09/2017** by the Secretary, Fiji Electricity Authority Tender Committee in the presence of three other responsible officers.

5. ACCEPTANCE OF TENDERS

The Purchaser shall not be bound to accept the lowest or any tender. A Tender shall not be deemed to be accepted unless and until notice in writing is handed by the Purchaser to the Tenderer or is posted by the Purchaser to the Tenderer at the address appearing on his Tender.

6. ACCURACY

No alterations to the tenderer shall be made after the date for lodging tenders. The Purchaser accepts no responsibility for the accuracy of any tender.

7. EXPLANATIONS

If the Tender needs any clarifications, he should make his inquiry in writing to :

Mr Tuvitu Delairewa
The Supply Chain Manager
Fiji Electricity Authority
Private Mail Bag
Suva
FIJI
Telephone : (679) 3311 133 Fax : (679) 3311882
e-mail: TDelairewa@fea.com.fj

All explanations to the clarifications shall be answered in writing.

Vuda Power Station

Mirrlees Diesel Engine Control System with Panel Replacement for G1 and G2

Table of Clauses

A. Table of Clauses

A. Technical Specification

B. Schedules

1 General Requirements

1.1 Location

The new Mirrlees Diesel Engine Control System and the new Control Panels are to be installed at the Vuda Power Station owned by Fiji Electricity Authority (FEA) and operated by Contractor Penix Fiji Vuda Power Station is situated South and about 10 km from Lautoka City.

Vuda Power Station is located beside the Fiji Electricity Authority Control Center and houses four diesel driven Engine, 2 x 6MW Wartsila Engine and 2 x 5MW Mirrless Engine.

1.2 Scope

The new control system should to be a Program Logic Control (PLC) system with HMI on the local panel and a Scada for remote operation. All Bidders should have over 10years experience in Diesel Engine Control system. This experience requirement is compulsory for all Bidders.

The scope of the works shall comprise the design, manufacture, factory testing (witnessed by the Purchaser, or its representatives), delivery to site, installation and commissioning of the following equipment to replace the existing G1 and G2 Amot Control Panels and Control System that is to control G1 and G2 Mirlees Disel Generator in accordance with the Contract and manufacturing requirements of AS, NZS and IEC standards.

Scope requirements;

- 2 x new Control Panels with PLC Control systems to replace the existing control system that he two Mirrlees Blackstone Generator had for the last 40years.
- The PLC Control system should have an interposing Panel (HMI) on each panel

- The DC Supply for the two new Control Panels are to be supplied from the new 24V DC system that supplies the Generator MCC panels.
- A Scada system to be located in the existing Control Room which will enable the control of the two Diesel Generators G1 and G2.
- Replace other engine control parts if the same is faulty.

Scope includes the supply of;

- One set of spare parts;

- Four sets of installation, operation and maintenance manuals, as well as all relevant drawings, plus one electronic copy of the manual and drawings;

The requirements for the installation and commissioning are covered under Section 3 of this technical specification.

The new Control Panel shall be located in the same location as the existing panels.

The Contractor shall be responsible for the following requirements:

New Control Panels x 2

1. Redesign of the Engine controls, indications, instrumentation of these two Blackstone Mirrlees Engines.
2. The redesign will include the replacement of field switches/devices on the engine such as Pressure switches, Temperature switches, Level switches, flow switches, Speed monitoring, thermocouples and any other device that is required to be displayed on this panel. This includes associated device cables if the same is damage.
3. A PLC control design is required and this should include local Display on the Panel and a Common Remote Scada system that displays both Blackstone MIrrlees Engines parameters and controls. The Scada will be placed in the Station Control Room.
4. The PLC should be of Modicon or Schneider PLCs with Ifix or Wonderware Scada system.
5. The new Controls system will be also interphased to control the auxiliary motors on the MCC on Manual/Automatic modes and also start the Generator on Remote Auto Start/Stop Mode in a sequence listed in the attached Annex document (Description of Remote Automatic Start/Stop Circuit Operation).
6.

1.3 Delivery

The new Control Panels shall be delivered to Vuda power station, installed and commissioned according to Standard mentioned in this document.

1.4 Existing Drawings Supply Characteristics

The information on the existing AMOT Panels , instrument electrical diagram, is included in Annex A of this document.

Contrlol Panel Drawings

1. 10E31040 (FEA Drg No. 10-E13-040)
2. 10E31040A (FEA Drg No. 10-E13-040)
3. 10E31041 (FEA Drg No. 10-E13-041)
4. 10E31042 (FEA Drg No. 10-E13-042)
5. 10E31043 (FEA Drg No. 10-E13-043)
6. 10E31044 (FEA Drg No. 10-E13-044)

1.5 Climate

The following service conditions will apply

- Ambient temperature 10^{o}C to + 40^{o}C;
- 100 % humidity with rapid temperature drop can occur;
- The altitude is less than100m asl;
- Earthquakes can be expected.
- Rainy season is over the October-March period.

1.6 Standards

The equipment shall comply with the requirement of the latest revisions of the following standards, as applicable and the equivalent AS/NZS where available. In case of deviation between the IEC, ANSI and IEEE standards and the AS/NZS standards, the latter will take precedence.

1.7 Drawings

Specification drawings
The contract drawings shall be of the attached specimen in Annex B

Contract drawings
Contract drawings shall be provided by the Contractor to the Engineer to the Contract not later than four weeks after the contract award and shall include:

a. Fully dimensioned outline and layout drawings of the equipment.
b. Construction and assembly drawings showing details of the equipment including complete panel mounting details, electrical wiring, terminal blocks, electrical power connections and instrumentation.
c. Diagrams of all electronic and electrical circuits contained in the equipment.
d. Design calculations.

All the drawings prepared by the Contractor must comply with the FEA Drafting Specification for New Plant (see Annex B).
All drawings shall be A2, A3 and A4 standard sizes and in addition to the drawing title an information block shall be shown near the lower right hand corner to contain the following entries:

- Specification No.
- Contract No.
- Drawing approved
- Drawing approved subject to statutory approval
- Approval not required
- Provisional approval as noted. Design/Manufacture may proceed
- Not approved
- Date
- Space for Project Manager signature

1.8 Design Suitability

It shall be the Contractor's responsibility to implement the design requirements and objectives of the specification. Where the specification does not cover an aspect of the equipment design, the Contractor, in consultation with FEA, shall use a design that ensures correct and reliable operation.
The contractor shall assume full responsibility for the correct operation of the equipment.

Design work shall include, but is not limited to:

a) Provision of an overall programme.
b) A detailed Commissioning Plan to coordinate all required tests and inspections with the commissioning programme.
c) Layout drawings for the cubicles, cables routes, etc
d) Cable schedules
e) I/O list
f) Updating FEA drawing files and as built station drawings
g) Liaison with FEA representative for protection, control, and instrumentation.

Upon completing the draft design the Contractor shall submit the relevant documentation to the Engineer to the Contract who will convene a design review and Hazop meeting to verify that the design meets the objectives of the upgrading project. The Contractor shall address any deviation, or requirement identified through the design review meeting.

1.9 Manufacturing Programme and Progress Reporting

The Contractor shall supply to the FEA, not later than two weeks after contract award date, a manufacturing programme showing the proposed progress of drawings, manufacture, delivery of equipment and installation/commissioning.

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The contractor shall submit two copies of a brief and concise monthly progress report covering:

(i) The state of progress in manufacture and installation as measured against the approved Manufacturing and Installation Programme.
(ii) A statement of any delays and reasons why they have occurred.
(iii) An assessment of the effect of such delays on the attainment of the approved Manufacturing and Installation Programme (not necessarily solely contractual key dates).
(iv) A statement of the measure, which has been taken or is proposed to eliminate or at least minimize the effect of the delay.

1.10 Inspection and Test Plan

The Contractor shall submit for approval not later than 2 weeks from acceptance date of the tender, two copies of an inspection and test plan (and every subsequent changes).
If at any time during the execution of the Contract, it is found necessary to modify the inspections and test plan, then the Contractor shall submit a revised plan to FEA reprentative for approval.

1.11 Instruction Manuals

The contractor shall supply four copies of an installation, operation and maintenance manual at, or prior to, the time of the delivery. These manuals shall contain all the information necessary for the erection, installation, commissioning, operation and maintenance of the equipment and shall include copies of the technical descriptions of all other manufacture's items used.
The manuals shall be as simple and as clear as possible, fully illustrated with drawings and diagrams as necessary and detailed with part numbers for ordering replacements.
The manuals shall be submitted as an electronic copy as well.
In addition the manual shall contain the data sheets of all the parts used, suitable for identification and ordering purposes.

2. New Control Panel Technical Requirements

2.1 General Requirements

2.1.1 Scope of Contract

The equipment required to be supplied under this part of the contract consists of:

a) 2 x new Control Panel with PLC and HMI Design.
b) 1 x Common Scada system for remote control of the two Mirrlees Diesel Engine
c) Replacement of Field devices such as Pressure switches, Temperature switches, Level switches, Flow switches and thermocouples.
d) Use the 24V DC supply that is provided for the MCC Panel
e) Recommended spare parts.
c) Special erection and maintenance tools.
d) Installation, operation and maintenance manuals.
e) The original Software for the PLC, HMI and Scada should be provided to the FEA on a Laptop or have all loaded onto a Laptop which FEA will provide.

2.1.2 Service

The Control Panels are to be located inside the Vuda powerhouse will provide controls for G1 and G2. These two generators are Mirrrlees Blackstone Diesel Generators.

Available existing control drawings is Annexed in the document. The new design should be similar to the existing sequence of controls or better for the safe and economical running of these two Mirrlees Diesel Engines

2.1.3 Seismic Strength

The equipment will be installed in an area subject to earthquakes and shall withstand without damage or malfunction the most adverse combination of the following forces:

- Forced produced by the equipment own weight.
- Earthquake induced forces giving rise to horizontal and vertical accelerations of 0.75g acting through the centre of mass of the equipment. Both horizontal and vertical motions shall be combined to provide the most adverse effect unless it can be shown that there is insignificant interaction between the horizontal and the vertical motions of the equipment response.
- Electromagnetic and mechanical forces produced over the full range of the equipment operating capability.

Individual vibration sensitive components forming part of the equipment must be able to withstand induced loads resulting from periodic vibration having an acceleration of 0.75g over the frequency range of 1Hz to 15Hz.
All components shall be securely fastened into place. Provision shall be made to mechanically restraining all plug-in, or withdrawable devices and modular elements.

2.1.4 Drawings

Specification drawings

The drawings listed under Section 1.7 and 2.1.2 above are relevant to this part of the specification and are in Annex A.

Contract drawings

Contract drawings shall be provided by the Contractor to the Engineer to the Contract not later than four weeks from the contract award and shall include:

a. Fully dimensioned outline and layout drawings of the equipment
b. Busbar general arrangement, Layout and footprint drawings
c. Construction and assembly drawings showing details of the equipment including complete panel mounting details, electrical wiring, terminal blocks, power connections and instrumentation

d. Diagrams of all electric and electronic circuits contained in the equipment.
e. Design calculations (fault calculations, cable sizing, load list, load analysis, etc)
f. Protective device coordination and protection relay settings.

All the drawings prepared by the Contractor must comply with the FEA Drafting Specification for New Plant (see Annex B).

All drawings shall be A2, A3 and A4 standard sizes and in addition to the drawing title an information block shall be shown near the lower right hand corner to contain the following entries:

- Specification No.
- Contract No.
- Drawing approved
- Drawing approved subject to statutory approval
- Approval not required
- Provisional approval as noted. Design/Manufacture may proceed
- Not approved
- Date
- Space for Project Manager signature

2.1.5 Design Suitability

It shall be the Contractor's responsibility to implement the design requirements and objectives of the specification. Where the specification does not cover an aspect of the equipment design, the Contractor shall use a design that ensures correct and reliable operation.
The contractor shall assume full responsibility for the reliable operation of the equipment.

2.1.6 Manufacturing Programme

The Contractor shall supply to the Engineer to the Contract, not later than two weeks from contract award date, a manufacturing programme showing the proposed progress of drawings, manufacture and delivery of equipment.

2.1.7 Instruction Manuals

The contractor shall supply four copies of an installation, operation and maintenance manual at, or prior to, the time of the delivery. These manuals shall contain all the information necessary for the erection, installation, commissioning, operation and maintenance of the equipment supplied by the Contractor and shall include copies of the technical descriptions of all other manufacture's items used.
In addition the manual shall contain the data sheets of all the parts used, suitable for identification and ordering purposes

2.1.8 Training

The Contractor is required to provide training to 10 FEA personnel on;

1. the operation of the switchboard with related interlocks
2. switchgear operation
3. PLC reloading of software and work file
4.

2.1.9 Spares

The following should be included in the scope of equipment supply;

1. All ratings of thermal Protection and contactor used
2. All types of indications used
3. All types of switches used

2.2 Technical Requirements

2.2.1 Standards

The equipment supplied shall meet the following standards.

AS/NZS 3439 – Low voltage switchgear and control gear assemblies
AS/NZS 3497 – Low voltage switchgear and control gear
AS 1939 – Classification of degree of enclosure protection
IEC 6044-1, 2 – Instrument transformers

All electrical apparatus, materials and wiring shall comply with the AS/NZS 3439.1 Electrical Wiring Regulations as applicable. Equipment built to other standards will be accepted providing that in the opinion of the Engineer to the Contract they meet or surpass the above standards. Full details of the standard used shall be provided in the tender submitted.

2.2.2 New Control Panel

The drawing for the existing AMOT generator Control Panel is listed in the drawings Annexed A, Drg No. 10E31008 (Blackstone Drg No. 153546).

The new Control Panel shall be mounted on Anti Vibration devices

All instrumentation requirement are listed in this drawings with the existing panel dimensions.

Below are Pressure switches, Temperature switches, Flow switches and Level switches for the Generator Controls to be upgrade/replaced. There are also pressure gauges listed in the attached drawings that will be also required for upgrading or by use of other

Description	**Settings**		
Pressure Switches			
Lub Oil Inlet pressure	Low	Alarm	Shutdown
Lub Oil Filter Differential Press	High	Alarm	
Pedestal Bearing Lub Oil Press Low	Low	Alarm	Shutdown
Starting Air Pressure	Low	Alarm	
Air Filter Diff Pressure	High	Alarm	
Temperature Switches			
Lub Oil Inlet Temperature	High	Alarm	Shutdown
Lub Oil Inlet Temperature	High	Alarm	Shutdown
Valve Cage Water Inlet Temp	High	Alarm	Shutdown
Valve Cage Water Outlet Temp	High	Alarm	Shutdown
Jacket Water Outlet Temp	High	Alarm	
Heavy Fuel Temp	Low	Alarm	
Level Switches			
Jacket Water Flow Low	Low	Alarm	
Valve Cage Water Head Tank Level	Low	Alarm	
Lub Oil Sump Level Low	Low	Alarm	
Light Fuel Service Tank Level	Low	Alarm	
The Generator control philosophy/mode for these two Generators are described on attached PDF file “Gencont” and also attached drawing No.			

10E13040 (FEA No. 10-E31-040). **Flow Switches**			
Charge Air Radiator Cooling Air Flow	Low	Alarm	
Valve Cage Water Outlet Flow	Low	Alarm	

Note: Thermocouples should be referred to the annexed drawings.

2.2.4 New Control Panel Maintainability

It shall be possible to fully service, remove and replace existing functional units safely while the switchboard is in service and energized.
It shall also be possible to install additional functional units in spare positions on the switchboard and their associated cabling while the switchboard is in service and energized.
Visual inspection of the following equipment shall also be possible while the switchboard is in service and energized:

- Switching devices
- Conductor connections and markings
- Relay settings and indicators
- Fuse links

All circuit breakers, isolators, etc shall have provision for padlocking in the open (Off) position.

2.2.5 Auxiliary Power Supply

A new dc power supply system shall be part of the New MCC switch board Contract and will supply this new control panel with 24V DC.

2.2.6 Control Panel Construction

Cabinets

The equipment shall be constructed in free standing sheet metal cabinets suitable for top cable entry. The cabinet sheet metal work shall not be less than 2mm thick and gland mounting plates shall not be less than 3.5mm thick. Gland mounting plates shall be undrilled unpainted galvanized steel or brass for 3-phase cables, and brass or aluminum for single core cables.
The cabinets shall be provided with a base plinth being 100mm high as a minimum height.
The cabinets shall be suitable for mounting on Unistrut framework.
The panels shall be accessible on the front and on rear.
The cabinets shall comply with AS 1939. The degree of protections with the doors or covers of functional units or ducts open or removed shall not be less than IP21.

Panel wiring, ferrules and cableways

All panel wires shall be multi-stranded copper of at least seven strands and shall have radial thickness of PVC insulation to IEC 60502-1 standard.
The minimum conductor cross sectional area shall be $1.5mm^2$
The wiring insulation shall be coloured in accordance with the following table.

Colour of wire	Circuit Particular
Red White Blue Green with yellow stripes Black	AC Phase connections in current and voltage transformer circuits Connections to earth. AC neutral connections, earthed or unearthed, connected to the secondary circuits of current and voltage transformers and all the other neutral points. Connections in dc circuits

Light grey	

Inter panel connections shall be made in such a way that does not reduce the ability of the switchgear to contain an arcing fault.
The wiring shall be executed in a neat and orderly manner and the arrangement of wiring and the positioning of any cableways within each cabinet shall not obstruct access to equipment terminals and mounting devices.
Vertical cabling ducts extending the full height of each tier shall be provided for cabling access to each module. Vertical ducts shall be provided with internal full-length perforated metal supports for fixing cables by means of cable ties and shall be no less than 400mm in clear width. Each cable compartment shall be fitted with a lift-off hinged door.
Extra low voltage equipment, control wiring and busbars shall be grouped and separated from low voltage equipment.

Labels and engravings

All controls, instruments and indications shall be labeled with appropriate inscriptions describing their function. All switchboard equipment shall be numbered from left to right when viewed from the front of the switchboard unless noted otherwise.
All labels shall be submitted to the Engineer to the Contract for approval.
Labels shall have black background with white letters and shall be made of engraveable phenolic material engraved with suitably sized vertical characters. The label shall be fixed in place with suitable adhesive.
Nameplates reading "DANGER – LIVE BUSBARS" shall be affixed on each removable cover of busbar chambers of incoming supply connections. Each shroud over terminals of normally live bare metal shall be labeled "DANGER – LIVE TERMINALS" warning label shall have white lettering on red background.

Anticorrosion treatment

Equipment offered shall be constructed of materials and be finished in such a way that corrosion is minimized. Materials and combination of materials used in the construction of the equipment shall be selected and arranged to prevent bimetallic corrosion.

Ferrous parts shall be either:
Hot dip galvanized
Zinc-plated and passivated
Painted over zinc coating, or phosphate treated

Surfaces to be hot dip galvanized shall be sound, clean and free from harmful scale, rust, moisture or any foreign matter. Inspection of the completed surface preparation may be required by the Engineer to the Contract before galvanizing or painting begins.

Painting

If steel parts are not zinc coated, a suitable phosphate treatment or approved equivalent shall be applied. Where blast cleaning is necessary to remove rust or scales, it shall be prepared by the dry method of sandblasting.
The application of the first coat of paint shall follow immediately after inspection of the cleaned surfaces and in the case a surface becoming contaminated between cleaning and applying the protective coating, then it shall re-cleaned.
Primer (of the rust-inhibiting type) and undercoat paint shall be applied as soon as possible thereafter, each to a minimum thickness of 0.05mm. Finishing coats of baking enamel shall then be applied so that the complete paint system shall have a minimum thickness of 0.13mm with no porosity.
The colour of finishing coats of the internal surfaces shall be grey, whereas the colour of the external surfaces shall be advised by the Engineer to the Contract on contract award. All internal gear trays shall be painted white.

Quality control

The Contractor shall ensure that effective quality control procedures are instituted at his works and details of any quality assurance standards adhered to should be provided in the tender.
It will be expected that the quality control procedures will include at least the following:

a) Ensuring that materials/parts used in the manufacture of the specified work are free from defects and meet their specification. This must include checking against tolerances, and obtaining manufacturer's test and, where applicable, analysis certificates.
b) Inspection at the critical stages of all phases of the specified works
c) Verifying the accuracies of gauges and test instruments used for checking and commissioning the specified works.
d) Ensuring that the components, materials and processes are fitted, used and applied in accordance with their manufacturer's instructions.
e) Ensuring that the qualification and training of personnel used in the design, production, testing, erection and inspection processes are adequate for their respective functions.

The Purchaser may appoint an independent inspecting authority to certify that the Contractor's design, production, testing and quality assurance resources, procedures and facilities are appropriate to the specified work.

2.2.8 Power, Control, Signal Cabling and Earthing

2.2.8.1 Power cables

NA

2.2.8.2 Control Cables

In this specification the term 'control cables' shall mean any cables or cabling used for control, indication, protection and alarm purposes.
Control cable shall have copper conductors with PVC insulation rated for 600V and PVC overall jacket unless otherwise specified.
Control, indication, protection and alarm cables shall be installed as follows:

- On horizontal ladders, fixing is required for take off points and elsewhere as necessary to ensure a neat secure formation;
- On vertical cable ladders, cables may be bunched in groups and fixed to the Unistrut channel with clamps at intervals not exceeding 300mm. The overall height of the bunch shall not exceed 75mm.
- Where clamped to Unistrut channels, cables may be bunched in groups and fixed to the Unistrut channel with clamps at intervals not exceeding 300mm. The overall height of the bunch shall not exceed 75mm.

2.2.8.3 Cable Installation

A combination of cable ladder systems, ducts and conduits shall be provided to the cabling, taking into account aesthetics, maintenance access to other equipment, and environmental considerations. Where possible, existing cable ladder systems, ducts and conduits shall be used.
In locations where available space restricts the installation of cable ladders, cables may be clamped to perforated cable trays or to horizontal Unistrut channels, fixed directly to the wall. For vertical runs three methods shall be employed for the principal cable routes as follows:

1. Open cable ladders with cable strapped to the ladder with ties;
2. Cables clamped to Unistrut channels with Unistrut cable clamps or trefoil cable clamps;
3. Perforated cable trays. This method is limited to short, complicated runs with many directional changes and tee offs.

Power cables shall be spaced at least 20mm from the walls.
Cables may be supported by running in aluminum or PVC conduits or pipes fixed directly to the surface. These conduits or pipes shall be purely for the provision of mechanical support to the cable; sheath shall not be removed from cables within such conduits. Conduits shall be fixed in position with saddles at spacing of not more than 1,200mm.
Cable installation facilities shall be fixed to concrete with expanding type masonry anchors. Explosion driven fasteners shall not be used.

<u>Control and power cables on one ladder</u>

Where the number of power and control cables installed in the area does not warrant the installation of separate cable ladders, both types of cables may be installed on the one cable ladder side by side on the one set of Unistrut channels. In such cases control indication and alarm cables may be bunched as above, but power cables shall be spaced at least 300mm away from the control, indication, protection and alarm cables and from other power cables and be installed in one basic layer only.

Support of cables

All cables shall be provided with supports located as close as possible to the point of termination of the cables. Cables run on perforated cable trays shall be fixed with profile shaped saddles at spacing between 150mm and 300mm as required to ensure a neat installation without sagging between saddles. Cables leaving cable ladders over the side rail shall be fixed to the ladder at the point from where they start to lift. Where cables drop over the ladder rung, the sharp edge shall be fitted with a smooth radius drop-out fitting.

Cable protection

In all locations within 200mm of the floor and in any other locations where cables may be exposed to mechanical damage, the Contractor shall provide and install guards to protect the cables, or alternatively shall enclose the cables in aluminium, or PVC pipes or conduits. Where cables on ladders pass under or adjacent to pipes containing fluids they shall be provided with covers to divert any leaking fluid.

Conductors of different systems in raceway

Cables of different usage, voltage and classification shall as far as possible be physically separated in accordance with IEEE 422, however the following requirements must be complied with unless otherwise approved by the Engineer to the Contract.
Where cableway consists of two or more levels of cable ladder, power cables are to run on the higher level and control and instrumentation cables on the lower levels.
Control and instrumentation cables are to be physically segregated into two groups as follows:

- Control cables used for intermittent operation of devices, indication and alarms.
- Low level analogue signal typically 4-20mA and low level digital signals.

A minimum distance of 300mm shall be kept between all sound or telephone cables and any other cables except when cables paths cross at right angles, and where run with low level analogue or digital control cables.
Earthing cables shall be segregated from all other cables such that should an earth conductor be damaged by a high earth fault current, no damage will result to other cables.
Control and instrumentation cables are not to be run in the same cable ladder with high voltage cables under any circumstances.
Control cables may be run with power cables over short distances, such as entrances to motor control centres, provided that:

- The control wiring is insulated for the full power circuit voltage and is used to control only the equipment supplied by the adjacent power cables.
- Cables are installed in an order which will prevent any cable being damaged by the weight of the others.

Conductors of different systems in the same cables

Conductor used for ac and dc circuits shall not be carried in the same multi conductor cable. Low level process signal conductors shall not be carried with other signal conductors in the same multi conductor cable.
Separate cables shall be provided for control and instrumentation and power circuit.

2.2.8.4 Cable Ladders

Cable ladders shall be made of aluminium in all areas. The ladders shall not have deflections of more than 3.5cm when simply supported over a 6m span and carrying an evenly distributed load of 40kg per metre, noting however that the ladder shall be supported at ≤3m intervals. The cable ladders shall be

complete with all necessary non-combustible, corrosion resistant supports, hanger rods and brackets and the like.
Aluminium cable ladders shall not be placed in direct contact with unpainted or uncoated dissimilar metals other than zinc, tin or cadmium except when making conductive connections by an approved method.

2.2.8.5 Cable Identification

The Contractor shall identify the ends of all power, control, and instrument circuits in accordance to IEC 391 and/or FEA practice.

2.2.8.6 Termination and Ferrules

The end of every wire and every cable core shall be fitted with an appropriate crimp or cable lug and shall be fitted with a ferrule to provide a permanent method of identifying the wire or cable core.
Wire ends terminated in screw terminals must be crimped in boot lace ferrules.
The identification system used to mark each cable, core, or wire shall be manufactured from moisture and oil resistant insulating material and offer long life in the environment, which they are installed without fading or deterioration. The marker shall be of the interlocking type and shall grip the insulation firmly.
Where possible, phase identification of multicore power cables shall be self-coloured cores. For cables where the cables cores are not self-coloured, the phase identification shall be provided by insulated, non flammable, heat-shrinkable tubing, coloured appropriately.
Unless otherwise specified, the screens of screened cables shall be earthed at one end only. This shall generally be the end at which the signal originates.
Earthing of copper screens shall be by means of wrapping three or more turns of 1.0mm^2 stranded tinned copper earthing conductors over the exposed screen and making an effective soldered joint with the screen. The earth conductor shall be terminated at the equipment by means of crimp-on terminal lugs. All earthing conductor must be insulated.

2.2.8.7 Trefoil Cable Cleats

Trefoil cleats shall be of non magnetic material, fitting the contours of the single core cables and securely anchoring the cable into position. The cleats shall be capable of withstanding bursting forces of 4kN due to fault current in the cable.

2.2.8.8 Conduits

Conduit and conduit fittings shall comply with the requirements of, and be installed in accordance with the NZ Electricity Regulations Act.
Metallic conduits and fittings shall be aluminium. PVC conduit shall be of the heavy duty grade.
Where wiring is to be concealed from view, the conduit shall be installed above suspended ceilings, embedded in concrete, or chased in masonry walls. The chasing of concrete walls and floors is not acceptable.
Conduit shall be installed to allow easy and safe drawing of cables. Where conduits are bent, the inside radius of the bend shall be not less than six times the nominal size of the conduit. No more than two consecutive 90degrees bends or multiple number of bends adding up to a total of 180degrees shall be installed between two conduit ends. Where more than the above number of bends is required an intermediate flush draw-in box shall be provided. Conduit runs in excess of 10m shall also be provided with draw-in boxes.
Conduits exposed to view shall run parallel to the structural lines.
Where surface mounted conduit crosses an expansion joint, then expansion fittings must be provided.
All joint in PVC conduits shall be made waterproof by using suitable adhesive compounds. Suitable moulded threaded attachments shall be used for entry into equipment.
All surface mounted conduits shall be fixed in position with stand-off saddles and screws, spacing the conduits approximately 5mm off the surface, at spacings no more than 1.2m, for metallic conduits and 0.8m for PVC conduits.

2.2.8.9 Earthing

Cable ladders shall be bonded together to form a continuous electrical circuit and shall be provided with an electrical connection to the main station earthing busbar comprising of an aluminium conductor of not less than 70mm^2 in cross sectional area at each end and at the intermediate positions spaced not more than 10 metres apart.
All the electrical equipment must be earthed. The contractor shall ensure that all metal work encasing electrical items is bonded to earth.
Busbars and grounding conductors shall be rated to carry currents equal in magnitude and duration to that associated with the short circuit rating of the equipment.
The earthing terminals on the frames of control cubicles and other such enclosures shall be a M8 stud. The metal cases of all the instruments, relays and the like mounted within such enclosures shall be connected to this earthing stud by conductors of not less than 6mm^2.
Earthing connections between this stud and he existing station earth grid shall be via an aluminium strap not less than 90mm^2.

2.2.9 Tests

The equipment shall be thoroughly tested at the manufacturer's works. Should failure to comply with the guaranteed or specified standards occur, the Purchaser reserves the right to reject the item of equipment concerned.

Routine tests

Works tests shall include electrical and mechanical routine tests as appropriate as specified in the relevant standards.

Test Certificates

Certificates recording the test results shall be supplied in the form of separate documents for:

Type tests
Routine tests
Performance tests

2.2.10 Spares and Accessories

All special lifting and handling devices and tools required for the installation and maintenance of the equipment offered shall be supplied with the equipment.
The Contractor shall as a minimum supply spares as detailed in the relevant schedule. The Contractor shall also offer any spare parts considered necessary. The Purchaser reserves the right to vary the number of spares ordered when the contract is awarded.
Spares shall be supplied preserved against deterioration in storage. Packages shall be clearly marked so that the contents may be identified without opening.

2.3 Civil Work Requirements

2.3.1 Mounting of new switchboard

The new switchboard shall be mounted on the same position as the old board.
All new cubicles shall be bolted down to the floor with chem.-set bolts all around the base. The cubicle/panel design should be done to allow cable entry from the existing cable trench or overhead cable ladders/trays as if required. The Contractor shall be responsible for resealing the floor or any similar requirement after the new switchboard is installed and any other Civil Works required if their switchboard design layout differs from existing cable trenching layout.

After completing the design, the Contractor shall provide the drawings showing the dimensions and location for bolting the switchboard base to the concrete floor with the calculation of their seismic strength. Note the panels will be installed beside the Diesel Mirrlees Balckstone Engines and will encounter a lot of vibration.

2.3.2 Ducts

Where ducts or trenches are required through existing walls or floors the Contractor shall submit a methodology for the duct installation to the Engineer to the Contract for approval.

3.0 New Control Panel Installation and Commissioning

3.1 General Requirements

This installation specification stipulates the requirements for the upgrading of the existing the Amot Control panel and associated controls for the Mirrlees Blackstone Generator G1 and G2 of Vuda power station.
The contractor is required to notify the FEA Project Manager and the Engineer to the Contract at least two weeks prior to the commencement of work.

The Bidder/Contractor shall be responsible for the installation and commissioning of the new Control Panel and associated controls and shall bid accordingly. FEA shall provide manpower to assist as part of on the job training.

To ensure a good communication and a full understanding of the responsibilities of the parties, the Contractor is responsible for ensuring that Contractor's personnel is appraised of these requirements.
The following requirements for work at site shall be met by the Contractor:

- Site induction – All Contractor staff shall have current First Aid/CPR and PHC certificates, and shall undergo site induction before commencing any work at Vuda power station. The Contractor must ensure that any addition to the work team undergo this induction on their first arrival to site. Induction is to be arranged by the Contractor through the FEA Project Manager.
- A Contractor AHC holder must be present all times work is performed on site.
- The tendering company must hold and maintain an Employer License, applicable to all staff who are proposed to be used on this contract.

Standards and Regulations

The installation of the 415V switchboard, shall comply with the following standards.

Safety Rules, Fiji, or NZ Electricity Industry
General Safety Handbook, Fiji, or NZ Electricity Industry
AS/NZS 3000:2007 Australian/New Zealand wiring rules
AS/NZS 4325 Power cables
AS/NZS 2650 PVC-insulated cables for switchgear/control gear wiring
AS/NZS 5000.3 Multicore control cables
AS/NZS 4417 Cable markings
IEC 60702-2 Cable termination

3.2 Scope of Work

The contract works include providing supervision, administration and management, and supplying all construction equipment, materials supplies and services necessary for the installation, testing and commissioning of the new Control System and Panel as specified under Section 2 of this specification.
The Contractor shall manage the disconnection and removal of existing controlpanel and how to shift the new panel to site and how to effect the installation of and the connection of the various control circuits. The Contractor shall provide, a works program schedule with the minimum interruption to the Vuda Power Station power generation capability for FEA approval.

3.3 General Installation Requirements

To make easement of installation FEA will prefer Contract for this requirement to have more than 10years experience on the Control of Diesel Generators like the Mirrlees Blackstone.

Access and work shall be governed by the Safety Rules, Electricity Industry, April 1995. The Contractor is responsible for meeting all safety requirements as directed by the Engineer to the contract.
Standards of workmanship and materials referred to under Section 2 and 4 must be adhered to.
All work of the Contractor shall comply with the following regulations and standards:

General safety Handbook of the Electricity Industry SM-EI Parts 1, 2 and 3.
Electricity regulations and Electricity Safety book
AS/NZS 2017 Electrical installations – testing and inspection guidelines

Any work that the Engineer/FEA to the Contract will deem unsatisfactory in terms of compliance with the above standards shall be reworked at the Contractor's expense to the satisfaction and approval of the Engineer to the Contract.
The technical requirements regarding cabling, terminations and wiring are those specified under Section 2 of this specification.

3.4 Installation Procedures

The succession of work stages shall be such that, for minimizing the duration of the relevant outages of the main machines, it will be necessary to complete beforehand all the installation work that can be effected with the main units in service.
The principal areas of work associated with the installation and commissioning of the new Control Panel are:

- Setting in place the new control panel
- Connecting and testing progressively the incoming and outgoing cables to the new switchboard, endeavoring to have only one generator outage at any time;
- Testing of inter phasing controls to the new MCC Board for the controls of the aux motors and load test of the MCC panel.
- Test of the new Control panels with associated new replaced field devices
- Interfacing the PLC control unit and the Scada system in the Control Room .

Before commencing any such work the Contractor shall ensure that the following prerequisite have been met:

- Inform the Engineer to the contract and complete the site induction procedures
- Electrical, mechanical and hydraulic isolation of equipment as applicable
- Receive authorization documentation.

<u>Cabling</u>

The contractor shall supply all the following cable requirements:

- Replace the existing cables to the new field devices
- Provide new cables for the new Scada in the Station Control room.
- Any other accessories required for termination of cables to the new Control Panel.

The Contractor shall submit a detailed procedure for effecting the progressive connections of feeders and loads to the new switchboard with minimal impact on the availability of the unit still in service and with reliable power supply for the station essential services.

3.5 Equipment and Materials

The Contractor shall procure and supply the materials and equipment necessary to complete the installation of the Control Panels and its connections to the controls and auxiliary

services. The equipment and materials to be supplied shall include, but not limited to, the following items:

- Required control cables
- Cable accessories, racks, termination kits
- Holding down bolts
- Terminals for I/O connection
- All consumables

3.6 Testing and Commissioning

The Contractor shall be responsible for ensuring that all equipment and systems covered and altered by this contract are tested and commissioned successfully in accordance with manufacturer requirements and relevant standards.
The Contractor shall provide all equipment necessary for testing and commissioning and shall also submit to the Engineer to the contract a programme of the commissioning tests, with relevant estimated duration.
The pre-commissioning tests shall include but not limited to the following:

a) inspection of all the equipment for correct installation, functioning, labeling and wiring;
b) insulation resistance tests of all circuits to earth and between phases.

All control, protection, alarm and indication circuits shall be tested to ensure correct operation and shall include, but not limited to the following:

a) Local and Remote Start Stop of the Generators with all associated auxiliary motors;
b) point of control switch operation Local HMI and Scada in the Control Room
c) remote alarms and indications.
d) All protections operations

Any defect or inadequacy identified through the tests shall immediately fixed, or listed in a Commissioning Defect sheet if it cannot be fixed immediately.

Two weeks after commissioning, the Contractor shall carry out post commissioning checks on the equipment. All items noted on the Commissioning Defect sheet must have been fixed at this time and written confirmation of their completion produced during these checks.
Following the completion of the commissioning tests, the Contractor shall check spares against list and put them into stores.

At this time the Contractor shall deliver all outstanding documentation including compliance certificates, as-built drawings, O&M manual, commissioning test report as well as the close out report to the satisfaction of the Engineer to the Contract.

4. Post Award Documentation Requirements

In addition to the supply of the equipment called upon in this Specification, the Contractor shall comply with the requirements set out in the following clauses.

4.1 Information to be Supplied by the Contractor

In addition to the supplied of the plant called for in this specification the Contractor shall comply with the requirements set out in the following clauses.
All drawings and other information, including technical manuals, instructions and plant and equipment markings and labels shall be submitted in English.

4.2 Manufacturing Programme

The Contractor shall submit for approval, not later than two weeks from acceptance of the tender, two copies of the Manufacturing Programme of the Control System Panels and controls, which shall contain:

(i) The list of activities and sub-activities with relevant time durations
(ii) The order in which the Contractor proposes to carry out completion of supply of the plant, including design, manufacture, factory test and delivery
(iii) The times when submission and approval of all the Contractor drawings and documentation are required.

If at any time during the execution of the Contract it is found necessary to modify the Manufacturing Programme, the Contractor shall submit for approval a revised Manufacturing Programme. No alteration to the Manufacturing Programme shall be made without written approval of the Engineer to the Contract.

4.3 Progress Reports

The supplier shall submit two copies of a brief and concise monthly progress report indicating:

(i) The state of progress in manufacture as measured against the approved Manufacturing Programme
(ii) A statement of any delays and reasons
(iii) An assessment of the effect of such delay on the attainment of the approved Manufacturing Programme
(iv) A statement of the measures that have been taken, or are proposed to eliminate or at least minimize the effect of the delay.

4.4 Inspection and Test Plan

The Contractor shall submit, not later than 3 weeks from acceptance of the tender, two copies of an inspection and test plan for approval of the Engineer to the contract.
If at any time during the execution of the Contract it is found necessary to modify the inspection and test plan, the Contractor shall submit for approval a revised plan.

4.5 Contract Drawings

The Contractor shall submit for approval not later than 3 weeks from acceptance date of the tender a list of proposed drawings required under this contract. The list shall include a brief drawing title.

4.6 Instruction Manual

The Contractor shall supply installation, commissioning, operation and maintenance manuals. The manuals shall contain all the information necessary for erection, installation, commissioning, operation and maintenance of the Control System equipment and shall include technical descriptions of all other sub-supplier's item used.
The manuals shall be as simple and clear as possible, fully illustrated with drawings and diagrams and detailed with data sheets and part numbers for ordering replacement.
Two draft copies of the manuals (marked as draft) shall be submitted for approval not later than 16weeks from acceptance of tender.
No later than two weeks after final approval, four copies of the approved manual shall be supplied for use during the installation work.
Four copies of any subsequent approved revisions shall be supplied for inclusion in the manuals.
The Contractor shall supply all final copies of the manuals in durable A4 size, four hole, D-ring binders. The binders shall be inscribed on the front cover and the spine with:

Fiji Electricity Authority
Vuda Power Station
Mirrlees Blackstone Control System & Panel
Contract No…….
Installation, O&M Manual

The contents of the manual shall be written specifically for the plant being supplied, shall be fully indexed and shall generally follow the format and include the information as outlined in the following clauses.

General Information

The following general information shall be included in the manuals:

(i) Title page containing the following information:
   a. Base data,
   b. Type and model.
   c. Name of station it is to be installed in.
   d. Contract number.
   e. Serial numbers.
   f. Standards the New Control Panels were built to.
   g. Manufacturer's address.

(ii) A general description (including any special features) referring to photographs and figures where appropriate.

(iii) A technical schedule giving the following information:
   a. All the information required by the Specification's technical schedule.
   b. A full schedule of weights and dimensions.
   c. Current and voltage rating of all components, i.e. maximum continuous, emergency, overload capability, and fault current withstand capability.

(iv) The serial numbers and manufacturer's address for all items supplied by other manufacturers.

(v) Details and drawings of any special tools required for installation, operation or maintenance.

(vi) Colour photographs showing external views and views inside the cabinets.

Description of the equipment

The detailed description of the equipment covering the technical characteristics shall be followed by the headings that specifically illustrate the installation, commissioning, operation and maintenance procedures, as well as the spares requirements.

- **Installation Instructions**

Detailed instructions shall be included for the handling, installation and storage of the equipment including the following:

(i) A brief description on the method of dispatch (including precautions taken on shipping specifications if applicable) shall be supplied.

(ii) A detailed list of the checks required on arrival at site shall be given in the manual.

(iii) Detailed instructions on precautions and maintenance requirements to be taken for both long-term (greater than 3 months) and short-term (up to 3 months) storage.

(iv) Detailed instruction procedures.

(v) All drawings used in manufacture or assembly of the equipment shall be listed and referred to on the installation drawings. Where components are proprietary manufactured items they shall be identified on the drawings and manufacturer's name, model number and size stated.

- **Commissioning**

Detailed instructions for pre-commissioning and commissioning tests (procedure and expected results) and checks shall be supplied. Results of factory acceptance tests shall be included for comparison with acceptance tests.

- **Operating Guide**

A detailed operating guide shall be supplied.

- **Maintenance**

Detailed inspection, maintenance and test procedures shall be included and shall comprise:

(i) Instructions for routine tests

(ii) All necessary information for the correct setting, or other adjustment and testing of all items including proprietary manufactured items.
(iii) Lists and details of recommended inspection, assessment repair and test procedures. Areas subject to high stress or corrosion during operation shall be identified.

- **Spares**

A complete list of spares shall be provided in the manual. The spare parts list shall contain the following information:

(i) Part description and identification number to sufficient detail to facilitate Purchaser's orders.
(ii) Quantities of like parts on each piece of equipment.

4.7 Test Report and Calculations

The Supplier shall supply reports detailing test methods and recording test results in the form of separate documents for:

(i) Routine tests.
(ii) Special tests.
(iii) Commissioning tests.
(iv) Performance tests.
(v) PLC/Software configuration and parameter settings.

The Supplier shall supply four copies of all test reports within two weeks of completion of the FAT. Prints and oscillograph photographs of such quality that all lines and inscriptions are clearly legible shall be included in each test report.
The test reports and calculations supplied by the Supplier shall include:

(i) Contract number and name.
(ii) Equipment description and serial numbers.
(iii) Report number and date.

4.8 Shipping Documents

The Supplier shall forward shipping documents to the Purchaser prior to the time of delivery of the Plant in accordance with the General Conditions of Purchase.

5. Summary of Information Required after Contract Award

The number of prints/copies of the following data and drawings as indicated below shall be forwarded to the Engineer to the Contract for approval by the required dates.

Item No.	Description	No. Copies	Date required by
1.1	Confirmed Manufacturing Programme	2	3 weeks after award
1.2	Progress Reports	2	Monthly
1.3	Inspection and Test Plan	3	3 weeks after award
1.5	Drawing List	1	3 weeks after award
1.6	All Contract Drawings	3	4 weeks after award
1.7	Instruction Manuals	5	16 weeks after award

6. Information Required after Contract Award as Final Versions

The final versions of prints/copies of the following data and drawings as indicated below shall be forwarded to the Engineer to the Contract by the required dates.

Item No.	Description	No. Copies	Date required by
1.9	Updated Manufacturing Programme	2	3 week after approval
1.10	Inspection and Test Plan	3	3 week after approval
1.11	Drawing List	1	16 weeks after award
1.12	Contract Drawings	3	18 weeks after award
1.13	Instruction Manuals	5	3 weeks after approval
1.14	Test Reports	4	2 weeks after FAT
1.15	Shipping Documents	1	Prior to shipment
1.16	Software licenses (registered in the name of FEA)	2	16 weeks after award

B. Schedules

Schedule 1 Price schedule

The Bidder shall provide price schedule for

- one Control System and Panel requirement for the two Diesel Generators

Below are formats of price schedules that Bidders may use or may submit similar formats.

Schedule 1A – Prices

Item	Quantity	Description	Unit price	Total price
1	**1**	**415V main switchboard**		
2	**1**	**Set of contractual spares**		
3	**1**	**Set of special tools**		
4	**1**	**Installation/commissioning of 415V switchboard**		

Schedule 1B – Packing and Shipping

Item	Quantity	Description	Unit price	Total price
1	**1**	**415V main switchboard**		
2	**1**	**Set of contractual spares**		
3	**1**	**Set of special tools**		

Schedule 1C – Schedule of Essential Spare Parts

Item	Quantity	Description	Unit price	Total price
1	**1**	**Air circuit breaker spring charging motor**		
2	**1**	**Air circuit breaker trip and closing coil set**		

Schedule 1D – Labour, plant and materials for variation work

Item	Description	Unit	Rate
1	**Labour (*)**		

	a. Supervisor	**Hr**		
	b. Test Technician	**Hr**		
	c. Electrical Fitter	**Hr**		
	d. Welder	**Hr**		
	e. Labourer	**Hr**		
2	**Plant**		**With Op.**	**Without Op.**
	a. Mileage (state vehicle)	**km**		
	b. Mileage (state vehicle)	**km**		
	c. Compressor (state data)	**hr**		
3	**Material**			
	a) Control cable (state data)	**m**		
	b). All control switches	**m**		
	c.	**m**		

(*) The hourly rate shall be inclusive of any on/off site overhead

Schedule 2 Manufacturing Programme

The Tenderer shall submit with the tender a proposed manufacturing Programme in the form of Gantt chart using Microsoft Project or similar project management software.
The Gantt chart shall incorporate the key dates and show the activities necessary throughout the contract period to indicate the Tenderer's programme for manufacturing and delivery of the goods. The programme shall include as minimum:

1. The scheduled start and finish date for each activity
2. The float associated with the scheduled dates
3. The duration of each activity
4. The identification of all milestone dates
5. The critical clearly shown.
6. The key dates, as follows:
    - Commencement of design
    - Completion of design
    - Award of sub-supplier purchase orders
    - Shipment of critical materials/items
    - Receipt of critical materials/items
    - Commencement of fabrication of major items
    - Completion of fabrication of major items
    - Commencement of assembly
    - Completion of assembly
    - Commencement of testing
    - Completion of testing
    - Packing
    - Shipping
    - Arrival at Vuda power station

Schedule 3 Tenderer's Experience

The Tenderer shall supply the following information with the tender:

1. A statement setting out the experience, resources and facilities at the Tenderer's disposal, and that of their sub-contractors, in the supply, maintenance, testing, delivery of items to be supplied under the contract.
2. Years of experience working with controls of this similar Diesel Generator Controls as requirement is more than 10yrs experience.
3. Details of the Tenderer's previous experience in the supply of similar type of goods and equipment to that offered. The information to be supplied shall include:

- Model/type number
- General description
- Number installed
- Date installed
- Country
- Customer name and address

Schedule 4 Information on goods offered

The Tenderer shall supply a full description of the goods offered showing suitability for its intended application.

If equipment is offered complying with a standard equivalent to any standard mentioned in this specification, then the Tenderer shall state the name of the standard, issuing authority, number, issue and full title of such standards and include an English language copy of the standard or relevant part thereof with the tender.

Schedule 5 Shipping Plan

The Tenderer shall provide with the tender, the details of how it proposes to ship of the completed goods to the delivery point, to include, but not limited to:

- Details and contents of the shipment
  - type of packaging, e.g. containerized, or crated
  - type of container
  - number of crates
  - weight and dimensions of each container or crate
  - storage, e.g. below deck or on deck
  - any proposed above deck cargo, or soft top containers, hazardous cargo information, special requirements, handling methods
- Value of shipment
- Name and location of factory
- Expected time of departure (ex factory)
- Name of port
- Expected time of departure ex port
- Expected time of arrival Lautoka Port, Lautoka, Fiji Islands
- Road transport details
- Expected time of arrival at the delivery point, i.e. power station

Schedule 6 Quality Assurance Programme

The Tenderer shall submit a draft Quality Assurance manual in accordance with the NZ Standard NZS 9901:2000. Where the Tenderer is already working to an equivalent or higher category of any internationally recognized Quality Assurance Standard then the standard may be proposed for the Work.

If a standard is offered as equivalent to or exceeding the specified NX Standard NZS9002:1990 category, the Tenderer shall state the issuing authority, number issue and full title of the Standard.

The tenderer shall provide evidence of Certification to NZS 9002: 1990 or equivalent or higher standard by a recognized authority.

The tenderer shall provide full details of the methods of traceability. Tenderers may propose any part or component of the goods for which it considers traceability inappropriate.

If the Tenderer is not certified to an internationally recognized Quality System the Purchaser may, during evaluation of tenders, call for further information and may require to audit the supplier quality system.

Schedule 7 Proposed Subcontractors and Sub-suppliers

Tenderers shall submit with the tender a list of Sub-Contractors and Sub-Suppliers that they propose to employ together with a brief description of the Plant or Work they propose to sublet.

Description of Sub-suppliers/contractors	Name/address of Sub-supplier/contract

Schedule 8 Deviation from / Exceptions to Tender Documents

The Tenderer shall specify below, in detail, all deviation from, exception to and alternatives offered to the tender document, including reference to the appropriate clauses or sub-clauses. Any entry shall be referenced to the Tender Document Clause No. to which they refer. A complete copy of this schedule should be supplied with the tender.

The Tender shall be deemed to be compliant with the content and intent of the tender document except in respect of deviation or exceptions listed in this schedule. If no deviations or alternatives are proposed by the Tenderer, enter "**None"** below.

No deviations from or exception to or alternative to the Tender Document shall be made subsequently to the contract without the written approval of the Purchaser.

Clause No.	Details of Deviation/Exception	Reason for Deviation/Exception

Schedule 9 Technical Data Schedules

The Tenderer shall complete the following schedules and shall guarantee the particulars and performance set out therein. The Tenderer shall supply a copy of the completed schedule with the tender.

Schedule 9.1 Recommended Additional Spare Parts

The Tenderer shall complete the following table with the spare parts they recommend for:

- The duration of the warranty period
- 15years of operation

Such spare parts shall be in addition to the mandatory spare parts already listed in the tender document. The price for these recommended additional spare parts shall not be included into the bid price.

It shall be understood that:

- The Purchaser may at their sole discretion choose to purchase any one or combination and any quantity of these spare parts
- The price of such a purchase will be added to the contract price
- The delivery of such additional spare parts shall be subject to same terms and conditions as those applicable to the mandatory spar parts.

Description	Qty for DLP	Qty for 15yrs	Unit price $

	duration		

Schedule 9.2 Special Tools

Item	Description	Use	Number	Weight

Schedule 9.3 Consumables

Item	Unit quantity	Quantity for 1yr	Supplier 1	Supplier 2

Schedule 9.4 Technical Support

Description of Technical Support	Details of Personnel and Support Centres

Annex A – Drawings

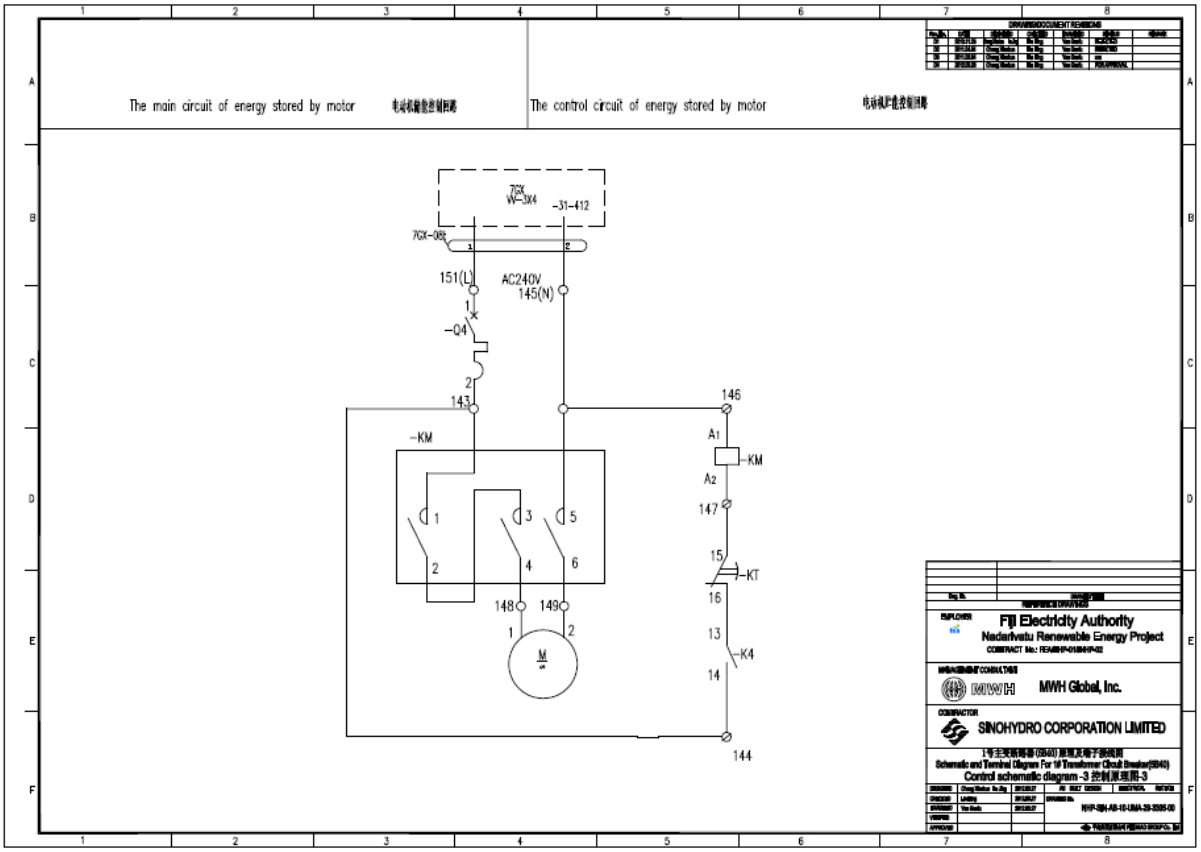
- Remote Automatic Start/Stop Circuit Operation Procedure
- Remote Automatic Start/Stop Circuit Operation Drg 1OE31004 (FEA Drg No. 10-E31-004)
- Drawings

a) 10E13040 (FEA Drg No. 10-13-040)
b) 10E13040A (FEA Drg No. 10-13-040A)
c) 10E13041 (FEA Drg No. 10-13-041)
d) 10E13042 (FEA Drg No. 10-13-042)
e) 10E13043 (FEA Drg No. 10-13-043)
f) 10E13044 (FEA Drg No. 10-13-044)

Annex B

FEA DRAUGHTING SPECIFICATION FOR NEW PLANT

Below is a sample



Annex C

Technical requirements to AS/NZS 3439.1

Item	Detail/Value	Notes
Service Condition	Indoors where the switchboard is in a well ventilated area	
Cable Entry (Incoming supply cables)	Top and Bottom Entry	
Cable Entry (Outgoing cables)	Top and Bottom Entry	
Access	Front access. Rear access for busbar inspection	
Supply Voltage (V)	415V, 3 phase, 4 wire	Classification in AS/NZS3439.1
Supply Frequency (Hz)	50Hz	Classification in AS/NZS3439.1

Connected Load (A)	NA	Classification in AS/NZS3439.1
Fault Level (kA)	NA	Classification in AS/NZS3439.1
Fault duration (sec)	NA	Classification in AS/NZS3439.1
Diversity	NA	Classification in AS/NZS3439.1
Ambient Temperature (°C)	10-40°C	
Relative Humidity (%)	Up to 90%	Damp conditions
Chemical Present	Nil	
Pollution Degree	Degree 3	Classification in AS/NZS3439.1
Segregation	Form 3b or 4	1. Separation of busbars from the functional units and separation of all functional units from one another. 2. Separation of terminals for external conductors from the functional units, but not from each other. Terminals to be shrouded with removable boots. 3. Terminals for external conductors separated from busbars
Degree of Protection	IP43 or better	Live parts, ingress of foreign bodies and liquid
Spare Space	10% minimum	
Module Style	NA	
Main Circuit Breaker	NA	
Bus Coupler	NA	
Power Monitors	NA	
Motor Starters	NA	
Motor Starter Communication	NA	
Soft-starters	NA	
Soft-starter Communication	NA	

Tender Submission - Instruction to bidders

It is mandatory for Bidders to upload a copy of their bid in the **TENDER LINK** Electronic Tender Box no later than **4:00pm, on Wednesday 20th September, 2017**

To register your interest and tender a response, view 'Current Tenders' at:
https://www.tenderlink.com/fea

For further information contact The Secretary Tender Committee, by e-mail
TDelairewa@fea.com.fj

In additional, hard copies of the tender, one original and one copy must be deposited in the tender box located at the FEA Head Office, 2 Marlow Street, Suva, Fiji no later than **4:00pm, on Wednesday 20th September, 2017-** Addressed as

Tender – MR 222/2017 Upgrade of the Vuda G1 & G2 Amot Control Panels and Associated Control System

The Secretary Tender Committee
Fiji Electricity Authority
Head Office
Suva
Fiji

- **Hard copies of the Tender bid will also be accepted after the closing date and time provided a soft copy is uploaded in the e-Tender Box and it is dispatched before the closing date and time.**

Tenders received after **4:00pm** on the closing date of **Wednesday 20th September, 2017**

- will not be considered.
- Lowest bid will not necessarily be accepted as successful bid
- **It is the responsibility of the bidder to pay courier chargers and all other cost associated with the delivery of the hard copy of the Tender submission including any Duties/Taxes. Hard copies of the Tender submission via Post Box will not be considered.**