

# **FIJI ELECTRICITY AUTHORITY**

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FEA Headquarters  
2 Marlow St  
Suva

## **TENDER NO: MR99/2016**

**SUPPLY, INSTALL AND COMMISSION PROTECTION AND  
CONTROL PANELS AT RARAWAI AND PINEAPPLE CORNER  
SUBSTATIONS**

# INVITATION TO TENDER

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The Fiji Electricity Authority ("The Employer") invites sealed bids from suitable Switchboard and control panel manufacturers for the manufacture, test at manufacturer's work, packing, shipping (CIF to Suva Port), installing, testing and commissioning of the following:

1. 4 x Protection and Control panels for 33kV Line Feeder Circuit Breakers consisting of 4 x SEL 311L Relays and 4 x SEL 351S Relays
2. 4 x Protection and Control panels for 33kV transformer Circuit Breakers consisting of 4 x SEL 351S Relays and 4 x SEL 387E Relays.
3. 2 x Protection panel for Bus Section & Busbar Protection consisting of 2 x SEL 351S Relays and 2 x SEL 587Z Relays
4. 2 x SCADA Panel

**NOTE:** The Protection Relays are to be provided by FEA

These protection and control panels will be used for in-house protection upgrade at FEA's Rarawai and Pineapple Corner Substations.

All tenders for the contract shall be submitted on the appropriate forms provided and shall include the completed price schedule, technical schedule and schedules of experience etc. The bid shall be on the basis of a lump sum contract based on firm prices.

During evaluation of tenders the Authority will invite a tenderer or tenderers for discussions, presentations and any necessary clarification before awarding of the contract.

The tender submissions close at 1600hrs on Wednesday 19th October, 2016. Further information for this tender may be acquired from:

Tuvitu Delairewa  
General Manager Commercial  
Fiji Electricity Authority  
2 Marlow Street, Suva, Fiji. Phone:  
679 3224 185  
Email: TDelairewa@fea.com.fj

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# **1 INSTRUCTIONS TO TENDER**

## **1.1 GENERAL**

The Fiji Electricity Authority (hereinafter called the Authority) is a statutory body vested with the responsibility for the provision of electricity supply throughout Fiji. The scope for this tender is for the supply, install, test and commissioning of protection and control panels for 33kV switchgears. The supplied panels will be used for in-house protection upgrade work at Rarawai and Pineapple Corner Substations.

## **1.2 TYPE OF TENDER**

The Tenderer shall submit a fixed price tender. This requirement shall apply equally to the conforming tender as well as any alternative tender.

## **1.3 COMPLIANCE WITH INSTRUCTIONS**

The Tender shall be submitted in accordance with these Instructions and the letter of invitation to tender. All the necessary forms and schedules need to be completed and submitted with the tender.

## **1.4 ADDENDA TO TENDER**

Where the Authority finds it necessary to make amendments to or clarify the requirements of the tender documents during the period of tendering three copies of each Addendum will be forwarded. In the Appendix to Tender shall state the reference number and description of each of the aforesaid Addenda which has been considered during preparation of the Tender.

## **1.5 COMPLIANCE WITH SPECIFICATION**

The tender shall be based on the equipment and work specified and shall be in accordance with the Technical Specification. It should be noted that unless departures from specifications are detailed in Schedule I of the Technical Specification, the tender would be taken as conforming to the Specification in its entirety. The Tenderer shall tender for the whole of the Works included in the Specification.

## **1.6 DELIVERY PERIODS**

The Tenderer shall submit his tender on the basis which will permit the Works to be completed under normal circumstances by the completion dates stated in Schedule 3 of the Technical Specification.

## **1.7 CURRENCY AND CURRENCY EQUIVALENT**

The tender shall be in the currency of the Tenderer's home country. Preference will be given to Australian and New Zealand dollar currency. For Tender comparison purposes the currency or currencies in which the tender is offered will be valued in terms of Fijian dollars at the exchange rate quoted for the sale of the foreign currency for Fijian dollars quoted by the Reserve Bank of Fiji on the day the tenders are opened.

## **1.8 SIGNATURE OF TENDERER**

A tender submitted by a Partnership shall be signed by one of the members of the Partnership and shall be accompanied by a certified authorization of all the partners authorizing the individual partner to sign on behalf of the Partnership. A tender submitted by a Corporation to the Contract and shall be accompanied by a certified resolution of the Board of Directors authorizing the individual to sign on behalf of the Corporation.

## **1.9 INFORMATION FORMING PART OF THE TENDER**

The Tenderer shall supply with each set of the tender copies of the technical, price and information schedules of the Tender Documents duly completed with all missing information and shall also supply requisite drawings. A copy of the Tenderer's covering letter (if any) shall be submitted with each tender and each tender shall be accompanied by a full set of supporting matter which the Tenderer wishes to have considered by the Authority as supporting information for his tender. It is a mandatory requirement to submit the following documents as part of the tender proposal:

1. Tender Covering Letter with signature/seal of authorised signatory
2. Price & Payment Schedule
3. Bill of Materials
4. List of Spares and prices
5. Work Program
6. Departures from Specifications
7. List of Experience
8. Confirmation of Insurance Policies

## **1.10 CONFORMING AND ALTERNATIVE TENDERS**

No alternative bids shall be accepted.

## **1.11 NON CONFORMING TENDERS**

A tender which does not comply with the Conditions of Tendering or in which the technical price information schedules requiring information to be inserted by the Tenderer have not been completed in all respects may be considered informal will be rejected for these reasons.

## **1.12 VALIDITY PERIOD OF TENDERS**

Tenders shall remain valid for acceptance within **90 days** from the date of opening of tenders and a Tenderer shall not withdraw or amend his tender prior to the expiration of the Validity Period. In exceptional circumstances prior to expiry of the original tender validity period, the Authority may request the Tenderer for an extension in the period of validity. The request and the response thereto shall be in writing. A tenderer agreeing to the request will not be permitted to amend his tender price.

## **1.13 EXTENSION OF CLOSING TIME FOR TENDERS**

The right is reserved to amend the date set for the opening of tenders to any late date. If it is decided to extend the time for submission of tenders all prospective Tenderers to whom tender documents have been issued will be promptly notified.

## **1.14 MANDATORY LODGEMENT OF TENDER**

The tender bids can be submitted electronically at the following location: <https://www.tenderlink.com/fea> or can be sent in pdf format in a CD or disk.

For hard copy submissions, the tenderer shall prepare hard copies with one original and two copies of the tender proposal, clearly marking each one as: "ORIGINAL - TENDER PROPOSAL", "COPY NO. 1 – TENDER PROPOSAL", etc as appropriate. In the event of discrepancy between the original and any copy, the original shall prevail.

The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder, as the case may be. All pages of the bid where entries or amendments have been made shall be initialled by the person or persons signing the bid.

The bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialled by the person or persons signing the bid.

The bidder shall seal the original bids and each copy of the bids in an inner and an outer envelope, duly marking the envelopes as "ORIGINAL" and "COPY – No. 1" etc. as appropriate.

- a) be addressed to the Employer at the following address:

The Secretary Tender Committee  
2 Marlow Street,  
Suva,  
FIJI.  
Phone: 679 3224 185  
Facsimile: 679 331 1882  
Email: [TDelairewa@fea.com.fj](mailto:TDelairewa@fea.com.fj)

- b) Bear the following identification:

Bid for: Supply, Install and Commission Protection and Control Panels at Rarawai and  
Pineapple Corner Substations  
Bid Tender Number: MRXX/2016  
DO NOT OPEN BEFORE: 1600hrs on 19<sup>th</sup> October 2016

It is mandatory for the Bidders to include the following at the reverse of the envelope:

Company name  
Address

Unmarked envelopes without bidders name and address on the **reverse** shall be returned unopened to the bidder.

### **1.15 DEADLINE FOR SUBMISSION OF BIDS**

Hard copy and soft copy of the tender Bids must be received by the Employer at the address and Tenderlink specified above no later than 1600 hours (Fiji Time) on 19<sup>th</sup> October, 2016.

The Employer may, at its discretion, extend the deadline for submission of bids by issuing an addendum in accordance with Clause 1.4, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

### **1.16 ACKNOWLEDGEMENT OF TENDERS**

All tenders received will be acknowledged by post/email within 7 days after the date set for receipt of tenders.

### **1.17 TENDER EVALUATION**

After a preliminary analysis to ascertain whether or not the tender is in accordance with the requirements of the tender documents each tender will be considered with particular reference to its eligibility as being a manufacturer, offer testing facilities in its workshop, price, completion date, design capability, evidence of past performance on contracts of a similar nature, supply of reliable quality equipment and all other matters affecting the Tenderers ability to complete the Contract in accordance with the Authority's requirements.

### **1.18 ADJUSTMENT OF ERRORS**

The Authority reserves the right to adjust arithmetical or other errors in the Tender. Any adjustments made by the Authority to a Tender will be stated to the Tenderer prior to acceptance of the Tender. In the event of discrepancies appearing between words and figures in the Tender, the words shall prevail.

### **1.19 ACCEPTANCE OF TENDERS**

The Authority shall not be bound to accept the lowest or any tender not to assign any reason for the rejection of a tender and reserves the right to waive any informality in a tender. No tender shall be deemed to have been accepted unless such acceptance is notified to the Tenderer by notice in writing either by handing such notice to the representative of the successful Tenderer or by sending such notice by e-mail, facsimile or airmail post. Such notice shall include any essential identifying details of the tender. The date of acceptance of Tender shall be the date on which the above mentioned notice is given or posted or e-mailed.

### **1.20 LANGUAGE OF TENDER**

All Tenders together with any documents submitted by the Tenderer as part of any Tender shall be written in the English language.

### **1.21 PAYMENT SCHEDULE**

The contract shall be on a lump sum fixed price basis. The payment schedule will be broken down as follows:

- a. 95% upon complete installation, testing and commissioning of the protection and control panels by the contractor
- b. 5% upon expiry of the warranty period (12 months from commissioning stage)

### **1.22 CONDITIONS OF CONTRACT**

The Conditions of Contract shall be the AS 4910:2002 – General Conditions of Contract for the Supply of Equipment with Installation.

### **1.23 INSURANCE**

The Contractor is to confirm that they have in effect the insurance policies below:

1. Public and Products Liability Insurance
2. Industrial Special Risk Insurance
3. Insurance for Workmen's Compensation

## 2 GENERAL SPECIFICATIONS

### 2.1 SCOPE OF WORK

The scope of works for contract is for the manufacture, testing at manufacturer's work, packing, shipping (CIF to Suva Port), installation, testing and commissioning of the following:

- 4 x Protection and Control panels for 33kV Line Feeder Circuit Breakers consisting of 4 x SEL 311L Relays and 4 x SEL 351S Relays
- 4 x Protection and Control panels for 33kV transformer Circuit Breakers consisting of 4 x SEL 351S Relays and 4 x SEL 387E Relays.
- 2 x Protection panel for Bus Section & Busbar Protection consisting of 2 x SEL 351S Relays and 2 x SEL 587Z Relays
- 2 x SCADA Panel

**NOTE:** The Protection Relays are to be provided by FEA

The Contractor is to manufacture, install, test and commission the panels as per the design drawings and specifications provided by FEA, and the Standards mentioned herein.

### 2.2 SYSTEM PARTICULARS

|                                | 132kV            | 33kV                                      | 11kV             |
|--------------------------------|------------------|-------------------------------------------|------------------|
| Normal system voltage          | 132kV            | 33kV                                      | 11kV             |
| System Highest voltage         | 145kV            | 36kV                                      | 12kV             |
| Frequency                      | 50Hz             | 50Hz                                      | 50Hz             |
| Earthing of Neutral point      | Directly Earthed | Earthed through Neutral Earthing Resistor | Directly Earthed |
| Design Symmetrical fault level | 4500MVA          | 1125MVA                                   | 250MVA           |
| Standard kA rated              | (31.5kA)         | (31.5kA)                                  | (31.5kA)         |

### 2.3 SERVICE CONDITIONS

| Particulars                                    | Value                                         |
|------------------------------------------------|-----------------------------------------------|
| Daily average ambient temperature              | 32°C                                          |
| Max ambient temperature                        | 45°C                                          |
| Annual average ambient temperature             | 30°C                                          |
| Minimum ambient temperature                    | 5°C                                           |
| Relative Humidity                              | 95%                                           |
| Altitude                                       | 20m                                           |
| Maximum Wind Speed (under cyclonic conditions) | 90m/sec - gusting (under cyclonic conditions) |
| Isokeraunic Level                              | 50                                            |
| Seismic Level – open ended Richter scale       | 7 on the open ended Richter Scale             |
| Average Rainfall per year                      | 2663mm                                        |

## 2.4 POWER SUPPLY FOR ELECTRICAL OPERATION

| Application                           | Type | Range                   |
|---------------------------------------|------|-------------------------|
| Control/Alarm/Emergency               | DC   | 110V (89 – 132V)        |
| Supply Voltage of Auxiliary Equipment | AC   | 415/240V ( $\pm 10\%$ ) |
| Supply Voltage of Auxiliary Equipment | DC   | 110V (89 – 132V)        |

## 2.5 QUALITY OF MATERIALS AND WORKMANSHIP

All materials supplied and used by the contractor under this contract shall be new and of the high quality and class most suitable for working under the conditions specified and shall withstand the variations of temperature, atmospheric conditions arising under working conditions without distortion or deterioration or the setting up of undue stresses in any part and also without affecting the strength and suitability of the various parts of the work which they have to perform. All work shall be carried out and completed in a neat and professional manner to the approval of the Employer's Representative.

## 2.6 STANDARDS

IEC, IEEE and AS/NZS Standards are to be adopted in general. Any other national or international standard may be used if such standards are not less exacting than corresponding IEC Standard. In such an instance a copy of the relevant standard should be forwarded. The works shall be in accordance with the following standards:

|                     |                                                                                                                             |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------|
| IEEE Std C37.21 -   | IEEE Standard for Control Switchboards                                                                                      |
| IEEE Std C37.2 -    | IEEE Standard Electrical Power System Device Function Numbers and Contact Designations.                                     |
| IEEE Std C37.90 -   | IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus                                         |
| IEEE Std C37.90.1 - | IEEE Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus. |
| IEEE Std C37.100 -  | IEEE Standard Definitions for Power Switchgear.                                                                             |
| IEEE Std C37.13.1 - | IEEE Standard for Definite-Purpose Switching Devices for Use in Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear |
| IEEE Std C37.13 -   | IEEE Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures                                                  |
| IEC 60947 -         | Low Voltage switchgear and control gear assemblies                                                                          |
| IEC 60529 -         | Degrees of Protection provided by Enclosures (IP Code)                                                                      |
| AS 2650 -           | Common specifications for high – voltage switchgear and control gear standards                                              |

## 2.7 RISK OF FIRE

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage, which might be caused in the event of fire. All cabling entry openings shall be covered with fire pillows or foam to prevent fire entry.

## **2.8 TOOLS AND EQUIPMENT**

The tenderer shall forward a list of tools and equipment required for safe operation and maintenance of the installation and includes the cost of supplying such tools and equipment as part of the tender submission.

## **2.9 SPARES**

The tenderer is to forward a list of the spares for the control and protection panels as per the Schedule 2. The tenderer may include any items in the list of spares as is deemed necessary. The cost of supply of these essential spare parts should form part of the contract but should be shown in a separate price schedule.

## **2.10 PACKING**

Equipment shall be carefully packed for transport and shipment in such a manner that it is protected from all dust and climatic conditions during loading, transport, unloading and subsequent storage in the open.

Equipment shall be suitably packed and protected against vibration, movement and shock which may occur during loading and transport. Particular care in packing shall be taken when the apparatus is transported by road.

Instruments and fragile items shall be packed separately. All items, which include delicate equipment, shall be sealed in polythene sheeting and silica gel desiccant or vapour corrosion preventive shall be inserted within the polythene packing. Straw shall not be used as packing material.

## **2.11 WARRANTY**

The Contractor shall provide warranty for equipment installed, commissioned and workmanship including revised As Built drawing submitted for the Works for a Period of twelve [12] months after delivery of the equipment. For all equipment supplied by third-parties, the contractor is to ensure that the warranties of these equipment are transferred to FEA as the beneficiary. The Contractor warrants to the Employer that all Works performed and completed in respect of the Warranted Works are in accordance with the standards and quality specified in the Contract or if not otherwise specified, the work is according to good trade practice expected in the energy industry.

## **2.12 PROGRAMME AND PROGRES OF WORK**

Within seven days of the receipt of the official FEA purchase order the contractor shall submit a programme of work for the entire project upto the delivery. The programme is to conform to the timelines as stipulated in this tender.

## **2.13 INSPECTION AND TESTING**

The Control Panels shall be tested according to IEEE Std C37.21. The tests outlined below shall be performed as a minimum on each panel as part of the routine testing:

1. Control Wiring Insulation Test - A power frequency test voltage of 1500V for 1 min shall be applied after all circuit grounds have been disconnected.
2. Control Wiring Continuity – The correctness of the control wiring of the control panel shall be verified by both of the following methods:
  - a. Actual electrical operation of the component control device
  - b. Individual circuit continuity checks by electrical circuit testers

3. Polarity and Phase Verification - Tests shall be made to ensure that connections to meters or relays, etc., are correctly made to the proper phase and with proper polarity.
4. General Mechanical Checks –
  - a. Cubicle is constructed as per the specifications.
  - b. Nameplates and Labels are correctly installed.
  - c. Earthing provisions and connections are as per the specifications.
  - d. All equipment has been installed correctly and neatly.
  - e. Panel wiring has been neatly arranged.
  - f. Wires have been crimped properly.
  - g. MCBs are of the correct ratings.
  - h. Panel Heater and light is operational
  - i. Spares have been accounted for as per the list
5. Primary and Secondary Injection Tests for the Protection Relays
6. Functional Tests for Protection Relays–
  - a. Busbar Protection Functional test
  - b. Line Differential Protection Test
  - c. Transformer Differential Protection Test
  - d. Overcurrent and Earth fault Protection Test

Upon completion of the routine tests at factory the contractor is to submit the test certificates for FEA's review and approval. The Contractor is to only commence with shipment of the goods once FEA provides approval of the routine test results.

## 3 DETAILED TECHNICAL SPECIFICATIONS

### 3.1 GENERAL

This part of the specification covers detailed technical requirement for control and protection panels complete with all necessary instruments, meters, switches, relays and other miscellaneous equipment, accessories and auxiliaries. FEA shall provide the necessary Protection SEL Relays for each panels. The Contractor is to ensure the Cut-outs on the blanking plates will fit the relays and other equipment to be installed by them. Once installed, all the required commissioning tests are to be carried out by the contractor as per FEA's requirement during the supervision of a representative from FEA. The complete list of all equipment to be procured directly by FEA is listed in the drawings.

The various control and relay panels and other equipment specified under this section shall be complete in themselves, with all main and auxiliary relays, fuses, links, switches, instruments, meters, timers, annunciators, indicating lamps, illuminating lamps, test terminal blocks, space heater, MCBs, fuses, mimic diagrams, name plates and other devices completely wired and assembled as per the approved schematics including labels, terminal boards, Earthing terminals, foundation bolts etc. It is the contractor's responsibility to mark up and submit any amendments to the As-built drawings to reflect modifications which have been implemented on the panels after approval from the FEA representative.

The Contractor is to also supply all the foundation bolts and channel nuts and washers required for securing the panels onto Unistrut P1000 Channels cast into the substation floor. Supply of the Unistrut channels is outside the scope of works.

Materials and components not specifically stated in this specification, but which are necessary for satisfactory operation of the equipment, and accessories shall be deemed to have been included in the scope of specification unless specifically excluded

### 3.2 CONSTRUCTION OF CUBICLES AND PANELS

The cubicles shall be of the self-standing, floor-mounted type and shall be provided with adequate means for floor fixing in seismically active areas. They shall be supplied complete with their fixing and lifting frames and eye bolts. Equipment and terminals shall be readily accessible and shall require a minimum of disturbance of associated adjacent equipment for access. The arrangement of panel wiring and multi-core cable terminal boards shall be in accordance with the relevant drawings. Enclosures shall provide for bottom entry of power and multi core cables via gland plates. Removable gland plates shall be located within the cubicles so as to provide adequate working clearance for terminating the cables. No equipment whatsoever shall be mounted on rear access doors. Each protection relay panel shall be of the rack type including 19" frame and a front cover door equipped with a glass window and each control panel shall be of the enclosed type. Indoor cubicles and panels shall have minimum IP 41 protection class, and all outdoor local control cubicles shall be of IP54 with sun/rain shades of adequate size. Each door shall be equipped with suitable earth straps of at least 16mm<sup>2</sup> highly flexible stranded copper wire with insulation in green-yellow colour. Doors are to be arranged so that every individual door or frame can be opened without moving doors of adjacent cubicles. Doors shall be of 2 mm thick sheet steel, equipped with 120° concealed hinges, with foamed-in seal and shall be provided with a stable, bolted, rectangular tube frame, with pre-punched holes at 25 mm pitch for fixing channels, covers, cable harnesses, wiring plan pockets and etc. In each outdoor cubicle atleast one door shall be equipped with sheet steel wiring plan pocket. If required, cross rails shall be fixed additionally. All cubicles shall have rear doors, for easy maintenance and repair of the main- and auxiliary equipment accommodated in the interior. Flexible earthing straps for personnel safety shall be mounted on frames of the front and rear doors and shall not obstruct access when working on and inside panel.

The Contractor shall perform a calculation for the heat dissipation for enclosures with the maximum installed heat-losses and shall propose a suitable temperature control method which shall be subject to the approval of the Employer's Representative. All enclosures and accessories shall be of stainless steel or corrosion protected by electrophoresis-dip-coat primers and final coats by an approved procedure as to suit the surrounding conditions at Site. The arrangement and mounting of all indicating devices, control switches, relays and other apparatus shall be to the approval of the Employer's Representative. The exterior and interior finish and colour of all cubicles shall be to the approval of the Employer's Representative.

The protection and control panels are to be of the **Rittal TS8** as specified in the drawings, together with the required parts to form a complete panel.

### 3.3 PANEL WIRING

Panels shall be supplied complete with interconnecting wiring provided between all electrical devices mounted and wired in the panels and between the devices and terminal blocks for the devices to be connected to equipment outside the panels.

All internal panel wiring shall be carried out with 600V/1000V grade, single core, stranded copper conductor wires with PVC insulation and shall be Fire Retardant. In selecting cable and wire sizes, due regard shall be paid to the appropriate de-rating factors in relation to the climatic conditions at site. All cables and wires shall continuously carry their rated currents under the worst temperature conditions, and shall also withstand maximum fault currents without damage or deterioration. The minimum cross sections of the conductors are to be:

- a) 2.5mm<sup>2</sup> for Current Transformer and Voltage Transformer Circuits and all power consumers such as motors, heaters, lighting, etc up to 10A.
- b) 1.5mm<sup>2</sup> for all instrumentation and control wiring, however, the maximum permissible Voltage drop is 5% for the furthest point at load.
- c) 4mm<sup>2</sup> for heavy power consumers up to 20A.

All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. The wiring shall be neatly run in PVC rigid base ducting. Both ends of every wire core and all secondary panel wiring (at the screwed terminal side for external connection as well as at the screwed device sides in the panel) shall be fitted with numbered slip-on ferrules of moisture and oil-resisting insulation material having a glossy finish, and with their identification numbers clearly engraved, each being the same as for the relevant terminal. Ferrules, of white colour with black letters (printed on wire markers and placed inside plastic sleeves), shall be fitted in such a way that they cannot become detached when the wire is removed from the terminal. (i.e. end crimps shall be provided). All secondary wiring for external plant and interpanel wiring shall enter the terminal blocks at one side only.

### 3.4 TERMINAL BLOCKS

All internal wiring to be connected to the external equipment shall terminate on terminal blocks, preferably vertically mounted on the side of each panel, as indicated in the General arrangement drawings. Terminal blocks shall be numbered consecutively in both sides, preferably beginning with 1, from left to right or top to bottom. Terminal blocks shall consist of single "insertion" type terminals of non-tracking, non-inflammable synthetic plastic, or ceramic of an approved type, lined up in one row. All terminals shall have two separate pressure clamping plates suitable for connection of incoming or outgoing stranded or solid conductors, respectively. However, only one wire per terminal will be accepted. Terminals with clamping screws in direct contact with the conductor are not acceptable. The standard terminals are to be of type **Phoenix Contact UK2.5B**. The measuring disconnect terminals for CT and Protection trip circuits are to be of type **Weidmuller 6/1/STB**.

Insulating barriers shall be provided between each group of power circuit terminals and between the terminal categories, the height and the spacing being such as to give adequate protection to the terminals. Control and relay circuits, current and voltage transformer secondary circuits, battery and auxiliary power supply wiring, supervisory, alarm and communication circuits shall be protected against conductive, electrostatic and electromagnetic influences. Terminals for 240V AC wiring shall be shrouded and marked by a warning label.

**At least 20% spare terminals** shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks. There shall be minimum clearance of 250 mm between the first row of terminal blocks and the associated cable gland plate or panel side wall.

Also, the clearance between two rows of terminal blocks shall be a minimum of 150 mm. Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal blocks is run in parallel and in close proximity along each side of the wiring duct to provide for convenient attachment of internal panel wiring.

The terminal assignments shall be as specified in the design drawings. However, the contractor is to review the terminal assignment and suggest improvements to the terminal assignments which would result in reduced wiring and complication.

## 3.5 EQUIPMENT AND ACCESSORIES

### 3.5.1 Protection Relays

The protection relays shall be of SEL make, with designated part numbers. These relays shall be mounted onto a blanking plate with the appropriate cut-outs. The details of the cutouts are provided in the drawings. The control wiring of these Protection Relays is to be completed by the contractor as per the approved FEA drawings.

### 3.5.2 Test Blocks

Switchboard type, back connected semi flush mounting type test blocks. All contact circuits to be rated at 20A continuously and 400A for 1s. The test blocks are to be of type **Areva MMLG02**. Rows of test blocks shall have nameplates as per the design drawings.

### 3.5.3 Miniature Circuit Breakers

The electrical control and protection circuits shall be protected by Miniature Circuit Breakers (MCBs) as per the design drawings. The MCBs shall have the C Curve tripping characteristic.

### 3.5.4 Control and Selector Switches

Control and instrument switches shall be rotary operated type preferably with silver to silver contacts of adequate making, carrying and breaking current ratings. They shall be provided with easily removable protective terminal covers and escutcheon plates clearly marked to show operating position and circuit designation plates and suitable for flush mounting with only switch front plate and operating handle projecting out. The control and selector switches shall be of type **Kraus & Naimer CA10** as specified in the bill of materials.

### 3.5.5 Indication Lamps

Indicating lamps shall be cluster LED type suitable for panel mounting with rear terminal connections. Lamps shall be provided with series connected resistors preferably built in the lamp assembly. Lamps shall have translucent lamp cover to diffuse lights colored red, green, amber, clear white or blue as specified. The lamp cover shall be preferably of screwed type, unbreakable and molded from heat resisting material. The supply for these lamps shall be connected to the DC station batteries unless stated otherwise. Lamps and lenses shall be interchangeable and easily replaceable from the front of the panel. Tools, if required for replacing the Lamps and lenses shall also be included in the scope of supply. Lamps shall be furnished 20% in excess of the actual numbers required and caps shall be furnished 10% in excess of actual numbers used for each colour. The indication lamps shall be of type Schneider **ZBVBG** LED lamps, complete with Schneider **ZB5AV** Pilot light heads and Schneider **ZB5AZ009** fixing collars.

### 3.5.6 Space Heaters

Space heaters shall be of adequate capacity and connected to single phase, 240V, 50 Hz supply inside each panel to prevent condensation of moisture on the wiring and panel mounted equipment. These shall not be mounted close to the wiring or any panel mounted equipment. Heaters shall be complete with thermostat and switch.

### 3.5.7 Interior Lighting

Each panel shall be provided with a LED light for the interior illumination of the panel during maintenance. The fittings shall be complete with switch-fuse unit and switching on the lighting.

### 3.5.8 Plug Point

Any GPO required is shown in the detailed design drawing. Where required, the GPO shall be a 240 Volts, Single Phase, 50 Hz, AC of HPM type GPO socket with switch suitable to accept 10 Amps pin shall be provided in the interior of each cubicle with an ON-OFF switch.

### 3.5.9 Other Accessories

Any and all other accessories normally required for testing, operation and maintenance of these panels shall be furnished by the contractor.

## 3.6 PANEL EARTHING

All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radio interference for effectively earthed systems under various switching conditions of isolators and breakers. The material and the sizes of the bus bar shall be at least 80mm<sup>2</sup> perforated copper with threaded holes at a gap of 50 mm with the provision of bolts and nuts for connection with cable armours and mounted equipment etc for effective earthing. This shall also include the earthing of the SEL Protection relays.

All current free metallic parts of all mounted equipment (i.e. metallic cases of relays, instruments and other panel mounted equipment including gland plate and panel door top and bottom) shall be looped by PVC insulated 2.5mm<sup>2</sup> stranded copper wires and connected to the earth bus.

### **3.7 NAMEPLATES AND MARKINGS**

Labels written in English shall be provided for all instruments, relays, control switches, push-buttons, indication lights, breakers, etc. In the case of instruments, switches and control switches where the function is indicated on the dial plate or on the switch escutcheon plate, no label is required.

Relays shall be clearly labelled according to their function in the circuits, and to their related equipment, which shall be identical to the designations as used in the circuit manuals. For equipment that projects through the panel or rack front, two labels shall be fitted one on the relay front and one on the rear of the equipment. Instruction plates in English language showing the sequence diagrams or cautions for maintenance shall be fitted inside of the front door of the electrical switchboards.

Samples of label wording shall be submitted for FEA approval. The labels shall be traffolyte type with beveled edges and black lettering on white background.

### **3.8 FACTORY TEST AT MANUFACTURER'S WORK SITE FOR APPROVALS**

It is a mandatory requirement for an FEA Engineer to be present at the manufacturer's site to witness the factory tests being carried out in accordance to the following standards:

- Control Panels: Test in accordance to IEEE Std C37.21: IEEE Standard for Control Switchboards

Manufacturer to advise FEA when conducting a Factory Test

### **3.9 SITE TEST AT FEA SUBSTATION PRIOR COMMISSIONING**

As per FEA requirement all tests carried out prior to commissioning of the newly installed control panels and the Protection SEL relays, FEA engineer is required to witness these tests and sign off the necessary check sheets once the required results have been achieved. These tests include:

- Control wiring of the Protection Relays
- Primary and Secondary Injections tests
- Functional tests
- Inter Trip Tests

FEA shall advise the contractor on any other additional tests that shall be required to be carried out on the site. All the testing shall be in accordance to the following standard:

- IEC 60255: Measuring Relays and Protecting equipment

## **SCHEDULE 1: BILL OF MATERIALS**

The Bill of Materials is provided in the detailed design drawings.

## **SCHEDULE 2 SPARES & TOOLS**

The items below are to be supplied loose as a minimum. The contractor may add additional spares as may be required subject to approval by FEA. Note that spares for all the mounting and fixing bolts, nuts and accessories which are required for installation and operation of the control panels are to be supplied as mandatory and are not listed in the spares here. The contractor is to submit a complete list of the spares and the cost for each item separately.

1. 10 x Green LED Lamp fitting c/w lamp, pilot head and collar
2. 10 x Red LED Lamp fitting c/w lamp, pilot head and collar
3. 10 x White LED lamp fitting c/w lamp, pilot head and collar
4. 100 x terminals – Phoenix Contact UK2.5B
5. 1x panel light (LED, White) as per specifications in the drawing
6. 1x Microsoft Surface Pro 4 i5 with 8GB RAM, 512GB HD with Surface Pro Type Cover

The price of Spares and Tools shall be such that it can be taken out from the overall tender price for the evaluation of the tender bid.

## SCHEDULE 3 WORK PROGRAM

The Contractor is required to state the commencement and completion dates for different components of the project schedule given below. The Contractor is required to also submit a Gantt chart showing the timelines. FEA expects delivery of the control panels by 5<sup>th</sup> December 2016, based on a Contract agreement being put in place by 26<sup>th</sup> December 2016 and an Official purchase Order issued by 16<sup>th</sup> January 2017.

| Component or Work                     | Commencement Date | Completion Date |
|---------------------------------------|-------------------|-----------------|
| 1. Receipt of Official Purchase Order |                   |                 |
| 2. Submit marked up Design Drawings   |                   |                 |
| 3. Procurement of Materials           |                   |                 |
| 4. Build of Panels                    |                   |                 |
| 5. Factory Testing of Panels          |                   |                 |
| 6. Packaging                          |                   |                 |
| 7. Shipping                           |                   |                 |
| 8. Installation at FEA Site           |                   |                 |
| 9. Site Test                          |                   |                 |
| 10. Commissioning                     |                   |                 |
| 11. Final Handover                    |                   |                 |
| 12. Submission of Test Results        |                   |                 |
| 13. Submission of Operating Manuals   |                   |                 |

## SCHEDULE 4 PRICE & PAYMENT SCHEDULE

The prices below are to be inclusive of shipping, CIF to Suva Port.

Currency of Tendered Price: .....

| Component                                                                 | Price |
|---------------------------------------------------------------------------|-------|
| Manufacture and Supply of 4 x Line Feeder                                 |       |
| Manufacture and Supply of 4 x Transformer Feeder                          |       |
| Manufacture and Supply of 2 x Busbar & Bus Panels                         |       |
| Manufacture and Supply of 2 x SCADA Panels                                |       |
| Installation of Control Panels at Rarawai and                             |       |
| Installation of all SEL Protection Relays                                 |       |
| Control wiring of the panels and Panel to Plant circuit breaker/Isolators |       |
| Testing and Commissioning of the Panels and Panel to Plant                |       |
| Supply of Tools & Spares as Listed in Tender                              |       |
| <b>Total</b>                                                              |       |

The Payment Schedule shall be as per the table below:

| Milestone                                                    | Percentage | Amount in Dollars |
|--------------------------------------------------------------|------------|-------------------|
| Receipt of Goods by FEA                                      | 30%        |                   |
| Install, Test and Commissioning of the Panels                | 65%        |                   |
| Expiry of Warranty period (12 months after receipt of Goods) | 5%         |                   |

Total Contract Price (in Words) .....

.....

Authorised Signatory of Tenderer:

Signature: .....

Name: .....

## SCHEDULE 5 LIST OF EXPERIENCE

The Contractor is to submit a list of Projects worked under with a similar scope, involving the design and manufacture of control panels for outdoor switchgear 33kV and above, in chronological order of year completed.

| Client | Project Scope and Description | Approx Project Value | Year Completed |
|--------|-------------------------------|----------------------|----------------|
|        |                               |                      |                |
|        |                               |                      |                |
|        |                               |                      |                |
|        |                               |                      |                |
|        |                               |                      |                |
|        |                               |                      |                |
|        |                               |                      |                |

## SCHEDULE 6 DEPARTURES FROM SPECIFICATION

The Tender shall be deemed to be entirely in accordance with the requirements of this Specification, unless otherwise stated. Should any departures from the requirement of this Specification arise, and/or any alternative proposals be submitted, the details shall be outlined below:

| Clause No | Departure from Specification |
|-----------|------------------------------|
|           |                              |
|           |                              |
|           |                              |
|           |                              |
|           |                              |
|           |                              |
|           |                              |
|           |                              |

## **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 19<sup>th</sup> October, 2016.**

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](mailto: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 31st August, 2016**- Addressed as

**Tender – MR 99/2016 – Supply, Install and Commission 33kV Control and Protection Panels for Rarawai and Pineapple Corner Substations**

**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 19<sup>th</sup> October, 2016.**

- 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.**

## **SCHEDULE 7 DRAWINGS**

Note: Refer to Attachment for the drawings

