



THE HASHEMITE KINGDOM OF JORDAN  
**ELECTRICITY DISTRIBUTION COMPANY (EDCO)**

**Tender No.( 42/2025 )**

**توريد معدات اتمة محطات**

**Tenderer:**

- Name: \_\_\_\_\_
- Address: \_\_\_\_\_
- Telephone/ Cellular: \_\_\_\_\_
- Fax: \_\_\_\_\_
- Website: \_\_\_\_\_
- E-Mail: \_\_\_\_\_
- Contact Person: \_\_\_\_\_

**Director General**

**Electricity Distribution Company (EDCO)**

**P.O. BOX: 830878.**

**Amman - 11183 - Jordan.**

**The Hashemite Kingdom of Jordan.**

**List of Contents**  
**Table 1 (List of Contents)**

<b>No.</b>	<b>Description</b>	<b>Page</b>
1	Cover Page	1
2	List of Contents	2
3	Invitation to Tender	3
4	General Conditions	4
5	Tendering Instructions	24
6	General Technical Conditions	26
7	Tender Agreement Summary	30
8	Form of Bid Bond	32
9	Form of Performance Bond	33
10	Form of Maintenance Bond	34
11	Technical Specifications & Schedules	35

## **INVITATION TO TENDER**

**(42/2025)**

**Dear Sir,**

You are kindly requested to tender for the supply of the below mentioned materials as per the quantities and technical specifications enclosed herewith, by filling in the schedules, signing the form of tender, and forwarding the complete tender documents to the attention of **EDCO-Director General** addressed as seen on the cover page, to be **received not later than 2: 00 pm (local time) ( 25/ 6 /2025).**

All bids must be accompanied with a bid bond of a value not less than **5%** of the highest alternative tender price, otherwise your tender will not be considered. The bid bond shall be enclosed in the same envelope of the tender and must be delivered to the above office **not later than 2:00 pm (local time) ( 25/6 /2025).**

- **The winning bidders/bidder shall bear the announcement costs in the local newspapers, no matter how often the announcement has been posted.**

## **GENERAL CONDITIONS**

- The below are general conditions of contract for the supply and delivery of plant and materials based on United Nations economic commission for Europe publication ref.: me/ 188 Geneva. March, 1953 And/or according to FIDIC 1999 if there is a constructions works.

### **1. Preamble**

1.1. These General Conditions shall apply, save as varied by express agreement accepted in writing by both parties.

### **1.2. Definition of Terms:**

The "**Purchaser**" shall mean "**ELECTRICITY DISTRIBUTION COMPANY.**" Hereinafter called "**EDCO**", and shall include **EDCOS** legal personal representatives and duly appointed engineers. The "**Engineer**" shall mean ". **ELECTRICITY DISTRIBUTION COMPANY** " or persons for the time being or from time to time duly appointed in writing by the purchaser to act as Engineer for the purpose of the contract.

The words "approved" and "approval" where used in these conditions or in the specification shall mean "**approved by**" and "**approval of**" the purchaser respectively. The "Vendor" shall mean the "Contractor" who's tender has been accepted by the purchaser and shall include the **Vendor's.** (Contractor's) legal personal representatives, successors and permitted assigns, "**F.O.B. Price**" shall mean the cost of the equipment delivered free on board the ship or truck or aircraft, all port charges and handling charges (also heavy lift if applicable) included .

The contractor must insure the material against all risks from the time it leaves the works until it is placed F.O.B "**CFR price**" shall mean F.O.B. price plus freight including unloading at the port of destination. All Marine Insurance will be affected by the purchaser.

**NOTE:-**The contractor must provide full details of the material to be shipped in good time for **EDCO** to arrange for Marine Insurance before the material is actually shipped.

## **2. Formation of Contract**

- 2.1. The contract shall be deemed to have been entered into when the purchaser has sent an acceptance in writing before the time set in the tender for acceptance or any such later date extended by the tenderer at the request of the purchaser.
- 2.2. Notwithstanding that the contract and correspondence in connection with the contract shall be in the English language, the contract shall be and be deemed to be a Jordan contract and shall accordingly be governed by and construed according to the laws for the time being in force in the Hashemite Kingdom of Jordan.
- 2.3. **Power to Vary The Work:** no alternations, amendments, omissions, additions, suspensions, or variations of the work, (hereinafter referred to as "variations") under the contract as shown by the contract drawings or the specification shall be made by the contractor except as directed in writing by the purchaser, but the purchaser shall have full power, subject to the provision hereinafter contained, from time to time during the execution of the contract by notice in writing to instruct the contractor to make such variation without prejudice to the contract and the contractor shall carry out such variations, and be bound by the same conditions, as far as applicable, as though they said variations occurred in the specification. If any suggested variations would, in the opinion of the contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees under the contract, he shall notify the purchaser thereof in writing, and the purchaser shall decide forthwith whether or not the same shall be carried out, and if the purchaser confirms his instructions, the contractor's obligations and guarantee shall be modified to such an extent as may be justified. The difference in cost, if any, occasioned by any such variations, shall be added to or deducted from the contract price as the case may require. The amount of such difference, if any, shall be ascertained and determined in accordance with the rates specified in the schedule of prices so far as the same may be applicable, and where the rates are not contained in the said Schedule, or are not applicable they shall be settled

by the purchaser and the contractor jointly.

But the purchaser shall not become liable for the payment of any charge in respect of any such variations, unless the instruction for the performance of the same shall have been given in writing by him. In the event of the purchaser requiring any variation, such reasonable a proper notice shall be given to the contractor as will enable him to make his arrangements accordingly, and in cases where goods or materials are already prepared, or any designs, drawings, or patterns made or work done that requires to be altered a reasonable sum in respect thereof shall be allowed by the purchaser. Provided that no such variations shall, except with consent in writing of the contractor, be such as will involve an increase or decrease of the total price payable under the contract by more than 25 percent thereof. The power given to the purchaser to make any alteration, amendment, omission, addition or variation to, from or in any part of the works shall include power to vary from time to time the date for the completion of the works or any part thereof, **also the purchaser shall have the absolute right to increase the quantities in such manner that the increment does not exceed the amount of 25% of the total price payable under the contract, however; the same prices awarded and any other relevant conditions shall remain the same for this purpose. This right is valid during the delivery period of the ordered material, implementation of works, or (90) days from the date of the letter of award, which is come later.**

- 2.4. **Precedence:** In the event of any discrepancy or contradiction between the provisions of the conditions of contract and of the specification, the conditions of contract shall take precedence. Furthermore in case of discrepancy between unit and total prices then unit price will be considered.
- 2.5. **Prices:** the tender calls for firm prices, unless; otherwise mentioned in the special requirements schedule.

### 3. **Drawings and Descriptive Documents**

- 3.1. The weights, dimensions, capacities, prices, performance rating and other data included in catalogues, prospectuses, circulars, advertisement, illustrated matter and price lists constitute an approximate guide. These data shall not be binding save to the extent that they are by reference

expressly included in the contract.

- 3.2. Any drawings or technical documents intended for use in the construction of the material or of part thereof and submitted to the purchaser prior or subsequent to the formation of the contract remain the exclusive property of the Vendor. They may not, without the Vendor's consent, be utilized by the purchaser or copied, reproduced, transmitted or communicated to a third party. Provided, however, that the said plans and documents shall be the property of the purchaser.
  - a. If it is expressly so agreed, or
  - b. If they are referable to a separate preliminary development contract on which no actual construction was to be performed and in which the property of the Vendor in the said plans and documents was not reserved.
- 3.3. Any drawings or technical documents intended for use in the construction of the material or of part thereof and submitted to the Vendor by the Purchaser prior or subsequent to the formation of the contract remain the exclusive property of the Purchaser. They may not, without his consent be utilized by the Vendor or copied, reproduced, transmitted or communicated to a third party.
- 3.4. The Vendor shall, if required by the purchaser, furnish free of charge to the purchaser at the commencement of the Guarantee Period, as defined in clause 9, information and drawings other than manufacturing drawings of the material in sufficient detail to enable the purchaser to carry out the erection, commissioning, operation and maintenance (including running repairs) of all parts of the material. Such information and drawings shall be the property of the purchaser and the restrictions on their use set out in paragraph 2 hereof shall not apply thereto. Provided that if the Vendor so stipulates, they shall remain confidential.

#### **4. Packing of the materials and shipping marks**

- 4.1. All materials, equipment and goods shall be very well packed, in seaworthy containers and/or wooden cases, etc. These should protect the material during shipping, handling, unloading for a reasonable period of storage at Aqaba and latter storage at EDCO stores.
- 4.2. Packing for indoor materials should be done in such manner as to adequately ensure no ingress of moisture, during the shipping and

storage periods.

- 4.3. Packing of fragile equipment (e.g. including instruments and porcelain) should be done in a way which ensures a reasonable resistance to impact breakage during transport.
- 4.4. Packing shall in general be adequate and in compliance with the best international practice.
- 4.5. A descriptive and fully itemized list shall be prepared for the contents of each packing case. A copy of this list shall be placed in a waterproof envelope under a metal or other suitable plate and securely fastened to the outside of one end of the case. And its position adequately indicated by stenciling on the case. Where appropriate drawing showing the erection marking of the items concerned shall be placed inside the case.
- 4.6. **EDCO** will supply the successful tenderer with a drawing of its shipping mark for utilization.
- 4.7. All packing cases, crates, barrels and drums shall remain the property of the purchaser.

## 5. **Inspection and Tests**

All inspections and tests of the Plant and materials shall be performed to the extent and in the manner as stipulated in the Standards specified. Type test certificates shall be submitted for all important items supplied. They shall contain all major technical particulars which are mentioned in the Technical Data Sheets.

Routine test certificates showing the results of all tests performed on the individual Plant and materials shall be furnished to the Purchaser before dispatch of such equipment. The Purchaser reserves the right to have certain tests performed in the presence of his representative or an independent testing authority. A suitable program for such inspections and tests shall be agreed upon and adequate notice (at least 21 days) shall be given when the Plant and/or materials are ready for inspection or test and every facility shall provide by the Contractor to enable the Purchaser to carry out the necessary inspections and tests. The performance of any

such inspections and tests in the presence of the Purchaser and/or an independent testing authority does not relieve the Contractor from his Contractual obligations.

## **5.1 General Inspection Requirement**

The whole of the material by the contract will be subject to inspection and testing by the engineer during manufacture and on completion. The approval of the engineer or the passing of any such inspection or test will not, however; prejudice the right of the purchaser to reject the material if it fails to comply with the specification when erected or to give complete satisfaction in service. The costs of all tests and inspection shall be borne by the contractor and shall be deemed to be included in the contract price. Before any material is packed or dispatched from the main or sub-contractor's works, all tests called for are to have been successfully carried out in presence of the engineer. Adequate notice shall be given when the material is ready for inspection or test and every facility shall be provided by the contractor and his inspection and his sub-contractors to enable the Engineer to carry out the necessary inspections and tests.

Triplicate copies of all principal test records and test certificates shall be supplied to the Engineer for all tests carried out in accordance with the provisions of the contract.

- 5.1.1** If expressly agreed in the contract, the purchaser shall be entitled to have the quality of the materials used and the parts of the instruments, both during manufacture and when completed, inspected and checked by his authorized representatives.

Such inspection and checking shall be carried out at the place of manufacture during normal working hours after agreement with the Vendor as to date and time.

- 5.1.2** If as a result of such inspection and checking the purchaser shall be of the opinion that any materials or parts are defective or not in accordance with the contract, he shall state in writing his objections and the reasons therefore.

- 5.1.3 Sub-Contractors:** Within two months of acceptance of the tenders

the contractor shall forward to the engineer a list of all sub-orders placed or intended. The contractor shall submit three copies of all sub-orders or selected by the engineer for progress or inspection. One copy of all drawings referred to in the sub-order is to be submitted unless otherwise agreed by the engineer. The drawings and sub-orders submitted to the engineer will cover all major components which are subject to electrical and mechanical pressure or stress when the material is in operation and also auxiliaries and stores which will be dispatched to site direct from the sub-contractor's work. For the purpose of this clause inter-works orders are to be treated as sub-order. Sub-orders are to include a statement advising the sub-contractor that the items being order will be subject to inspection and test by the Engineer. It is important that all copies of such orders are clearly marked with the main contractor's name and the following reference:

**ELECTRICITY DISTRIBUTION COMPANY. CONTRACT No. (42/2025)**

Sub-Contractors are to comply with all the applicable requirements of this specification. Orders issued by the sub-contractor are also to include the main contractor's reference on their sub-order in addition to the above-mentioned heading.

## 5.2 **TESTS:**

All tests should meet the requirements of latest international standard mentioned in the contract or any relevant standard

- 5.2.1 Acceptance tests will be carried out and, unless otherwise agreed, will be made at the Vendor's works and during normal working hours. If the technical requirements of the tests are not specified in the contract, the tests will be carried out in accordance with the general practice obtaining in the appropriate branch of the industry in the country where the material is manufactured.
- 5.2.2 The Vendor shall give to the purchaser sufficient notice of the tests to permit the purchaser's representatives to attend. If the purchaser is not represented at the tests, the tests report shall be communicated by the Vendor to the purchaser and shall be accepted as accurate by the purchaser.
- 5.2.3 If on any test (other than a test site, where test on site are provided for in the contract) the material shall be found to be defective or not in accordance with the contract, the Vendor shall with all speed make good the defect or ensure that the plant complies with the contract. Thereafter, if the purchaser so requires, the test shall be repeated.
- 5.2.4 Unless otherwise agreed, the Vendor shall bear all the expenses of tests carried out in his works.
- 5.2.5 If the contract provides for tests on site, the terms and conditions governing such tests shall be such as may be specially agreed between the parties
- 5.2.6 **Material Tests:** The contractor shall provide test prices as required by the engineer to enable him to determine the quality of the material supplied free of charge and any cost of the tests shall be borne by the contractor. If any test pieces fails to comply with the requirements of the appropriate specifications for the material in question, the engineer may reject the whole of the material represented by that piece, the contractor's designers and

Metallurgists will be consulted before any material is so rejected. In the event of the engineer being furnished with the certified particulars of the tests which have been carried out for the contractor by the suppliers of the material, he may, at his own discretion, dispense with the previously mentioned tests entirely.

**5.2.7 Tests at Manufacture's Works:** Works tests shall include all routine, electrical, mechanical and hydraulic tests in accordance with the relevant IEC standard or other standard may be approved except where departures there from and modifications thereto are embodied in this specification. For material not covered by an IEC or British standard or specifically mentioned in this specification the tests shall be agreed with the Engineer. After satisfactory completion of the witnessed tests at the works, the material shall be submitted for the engineer's approval preparatory to shipping. No item of material is to be dispatched to site until the Engineer has given his approval in writing.

**5.2.8 Test Certificates:** Triplicate sets of all principal test records test certificates and performance curves shall be supplied for all tests carried out in accordance with the provisions of this contract. These test records, certificates and performance curves shall be supplied for all tests, whether or not they have been witnessed by the engineer. The information given in such test certificates and curves shall be sufficient to identify the material or equipment to which the certificates refers and should also bear the contract reference and heading as given in clause 7.2 of this section.

**5.2.9 Rejection of the materials:** If Any item of material or component which fails comply with the requirements of this specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the engineer either in whole or in part as he considers necessary, and after adjustment or modification if so directed by the Engineer, the contractor shall submit the item for the item for the further inspection and / or test.

In the event defects of such a nature that the requirements of this specification cannot be fulfilled by adjustment or modification shall be replaced by the contractor, at his own expense, to the entire satisfaction of

the engineer.

### **5.3 Maintenance:**

The contractor must submitted maintenance bond equal to (5%) of the Order amount to guarantee the efficient and good working of the material supplied under the contract for a period of 12 months (Gregorian) from the date of delivery of the material to EDCO SORES in accordance with the General conditions of contract.

## **6. Passing of Risk**

Save as provided in paragraph 7.6, the time at which the risk shall pass shall be fixed in accordance with the International Rules for the Interpretation of Trade Terms (Incoterms) of the International Chamber of Commerce in force at the date of the formation of the contract.

## **7. Delivery:**

- 7.1. Unless otherwise agreed the delivery period shall run from the latest of the following dates:
  - a. The date of the formation of the contract as defined in clause 2.
  - b. The date on which the Vendor receives notice of the issue of a valid import license where such is necessary for the execution of the contract.
  - c. The date of the receipt by the Vendor of such payment in advance of manufacture as stipulated in the contract.
- 7.2. Should delay in delivery be caused by any of the circumstances mentioned in clause 10 or by an act or omission of the purchaser and whether such cause occur before or after the time or extended time for delivery, they shall be granted subject to the provisions of paragraph 5 hereof such extension of the delivery period as is reasonable having regard to all the circumstances of the case.
- 7.3. If a fixed time for delivery is provided for in the contract and the Vendor fails to deliver within such time or any extension thereof granted under paragraph 2 hereof, the purchaser shall be entitled, on giving to the

Vendor within a reasonable time notice in writing, to

**Claim a deduction of the price payable under the contract. Such deduction shall be calculated at the rate of one half of one percent (0.5%) of that part of the price payable under the contract which is properly attributable to such portion of the plant as cannot in consequence of the said failure be put to the use intended for each complete week of delay commencing on the due date of delivery, but shall not exceed a maximum percentage deduction of ten percent.** Such deduction shall be allowed when a payment becomes due on or after delivery. Save as provided in paragraph 5 hereof, such deduction of price shall be to the exclusion of any other remedy of the purchaser in respect of the Vendor's failure to deliver as aforesaid.

- 7.4. If the time for delivery mentioned in the contract is an estimate only, either party may after the expiration of two thirds of such estimated time require the other party in writing to agree a fixed time. Where no time for delivery is mentioned in the contract, this course shall be open to either party after the expiration of six months from the formation of the contract. If in either case the parties fail to agree, either party may have recourse to arbitration, in accordance with the provisions of clause 13, to determine a reasonable time for delivery and the time so determined shall be deemed to be the fixed time for delivery provided for in the contract and paragraph 3 hereof shall apply accordingly.
- 7.5. If any portion of material in respect of which the purchaser has become entitled to the maximum deduction provided for by paragraph 3 hereof, or in respect of which he would have been so entitled had he given the notice referred to therein, remains undelivered, the purchaser may by notice in writing to the Vendor require him to deliver and by such last mentioned notice fix a final time for delivery which shall be reasonable taking into account such delay as has already occurred.
- 7.6. If for any reason whatever the Vendor fails within such time to do everything that he must do to effect delivery, the purchaser shall be entitled by notice in writing to the Vendor, and without requiring the consent of any court, to terminate the contract in respect of such portion

of the material and thereupon to recover from the Vendor any amount not exceeding that part of the price payable under the Contract which is properly attributable to such portion of the material as could not in consequence of the Vendor's failure be put to the use intended.

- 7.7. If the purchaser fails to accept delivery on due date, he shall nevertheless make any payment conditional on delivery as if the material had been delivered. The Vendor shall arrange for the storage of the material at the risk and cost of the purchaser. If required by the purchaser, the Vendor shall insure the material at the cost of the purchaser. Provided that if the delay in accepting delivery is due to one of the circumstances mentioned in clause 10 and the Vendor is in a position to store it in his premises without prejudice to his business, the cost of storing the material shall not be borne by the purchaser.
- 7.8. Unless the failure of the purchaser is due to any of the circumstances mentioned in clause 10, the Vendor may require the purchaser by notice in writing to accept delivery within reasonable time. If the purchaser fails for any reason whatever to do so within such time, the Vendor shall be entitled by notice in writing to the purchaser, and without requiring the consent of any court, to terminate the contract in respect of such portion of the material as is by reason of the failure of the purchaser aforesaid not delivered and thereupon to recover from the purchaser any loss, suffered by reason of such failure up to an amount not exceeding the value of the material, the delivery of which has not been accepted.
- 7.9. If the winner contractor in the tender, refrained for supply the material or execution of works which award for him or failed to execute the contract on the limited time, or failed to replace the rejected material or works in another applying materials on his account, the tenders committee which take its previous design to award the tender for this supplier has the right to Confiscation the bid bond or the performance bond or part of them as commensurate with the material & works value.
- 7.10. If refrained bidder to comply with his offer or did not complete the necessary contract and signing of the purchase order and did not submitted the performance bond within 15 days from the date of the order, the tender s committee has the right to confiscated the bid bond.

### **Force Majeure**

- Notwithstanding the provisions of clauses 7, the supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the contract is the result of an event of Force Majeure.
- For purposes of this clause, "Force Majeure" means an event beyond the control the supplier not involving the supplier's fault or negligence. Such events may include, but are not restricted to, acts to the purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and fright embargoes.
- If a Force Majeure situation arises, the supplier shall promptly notify the purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as is reasonably practical, and shall all reasonable alternative means for performance not prevented by the Force Majeure event.

## 8. Payment:

### 8.1. **Terms of Payment:**

Subject to any deduction which the purchaser may be authorized to make under the contract or subject to any additions or deductions provided for under clause 2-3 above, The Company (EDCO) prefers to deal with the supplier on an **open account basis**, and the payment to be made as the following:

a. (10%) of the CFR contract value (as shown by the supplier's invoice/contractor invoice) on receipt of the following **legalized shipping** documents by EDCO:

- (Original Invoice + five copies)
- (Certificate of origin + five copies)
- (Bill of lading 3-negotiable + 5 non-negotiable)
- (Test certificate (where applicable) + 6 copies).
- 

**The original shipping documents must arrive to EDCO or to our bank before (5) days at least prior the materials arrival.**

b. (80%) of the invoice value to be paid within 60 days of Receipt of EDCO's certificate of acceptance, Receipt of goods at EDCO stores.

c. (10%) of the contract value within 60 days from expiration of the guarantee period.

If the bidder insists on L/C (letter of credit) as a method of payment, all L/C charges will be on his own expense, in all respects all banking charges are at vendor account, the terms will be as follows:

a. The L/C will be confirmed and irrevocable but has to be **acceptance** L/C, and the supplier has to send the following **legalized shipping** documents:

- (Original Invoice + five copies),
- (Certificate of origin + five copies),
- (Bill of lading 3-negotiable + 5 non-negotiable),
- (Test certificate (where applicable) + 6 copies).
- (Release of shipment (where applicable) – fax copy is accepted).

b. Payment will be released after submitting EDCO's certificate of acceptance to the bank within (30) days after receipt of goods at EDCO's stores.

In the case of a Jordanian Supplier (materials are delivered from local companies), payment will be made through presentation of the invoice as following:

- a. (90%) of the contract value to be paid within 30 days from date of receipt and acceptance of the materials at our EDCO stores.
- b. (10%) of the contract value within 30 days from expiration of the guarantee period (one year from the date of receipt and acceptance of the materials at EDCO stores)

**NOTE:**

- In case the supplier has better terms of payment than those mentioned above the purchaser will discuss such terms.
- Any deviation on the payment methods mentioned above, will negatively affect the evaluation of tenderer's offer.
- In case the payment by acceptance L/C, The performance bond should be valid for a period expiring at least one year after receipt of the last consignment in EDCO stores.
- EDCO has the right to request an additional bank guarantee equal to (5%) five percent to cover the guarantee period.

**Currency of Payment:** The contract price will normally be paid in the currency or currencies in which the price has been stated. The purchaser, however, reserves the right to make payments in the currencies of the countries of origin of goods and services at the exchange rates applicable at the time of payment of the contract price.

**Shipping documents shall comprise the following documents: -**

- 1) **Invoices** – one original, five copies.
- 2) **Shipping specification (packing list)** – six copies.
- 3) **Certificate of origin** – one original, five copies.
- 4) **Bill of lading** – 3 three negotiable, five non-negotiable.
- 5) **Test certificates (where applicable)** – six copies.
- 6) **Release of shipment (where applicable)** – fax copy is accepted.
- 7) **EDCO's Certificate of Acceptance** - fax copy is accepted

- 8.2. Any advance payments made by the Purchaser are payments on account and do not constitute a deposit, the abandonment of which would entitle either party to terminate the Contract.
- 8.3. If delivery has been made before payment of the whole sum payable under the Contract, plant delivered shall, to the extent permitted by the law of the country where the plant is situated after delivery, remain the property of the Vendor until such payment has been effected. If such law does not permit the Vendor to retain the property in the plant, the Vendor shall be entitled to the benefit of such other rights in respect thereof as such law permits him to retain. The Purchaser shall give the Vendor every assistance in taking any measures required to protect the Vendor's right of property or such other rights as aforesaid.
- 8.4. A payment conditional on the fulfillment of an obligation by the Vendor shall not be due until such obligation has been fulfilled, unless the failure of the Vendor is due to an act or omission of the Purchaser.
- 8.5. If the Purchaser delays in making any payment, the Vendor may postpone the fulfillment of his own obligations until such payment is made, unless the failure of the Purchaser is due to an act or omission of the Vendor.
- 8.6. If delay by the Purchaser in making any payment is due to one of the circumstances mentioned in clause 10, the Vendor shall not be entitled to any interest on the sum due.
- 8.7. Save as aforesaid, if the Purchaser delays in making any payment, the Vendor shall on giving to the Purchaser within a reasonable time notice in writing be entitled, and without requiring the consent of any Court, to terminate the Contract and thereupon to recover from the Purchaser the amount of his loss up to the value of the plant, the payment for which has been unreasonably delayed.

## 9. **Guarantee:**

- 9.1. Subject as hereinafter set out; the Vendor undertakes to remedy any defect resulting from faulty design, materials or workmanship.
- 9.2. This liability is limited to defects which appear during the period (Hereinafter called the Guarantee Period) of **fifteen** months from date of dispatch ex-works or twelve months from the date of accepting the Materials at EDCO stores whichever shall be later.

Or in case of turn key projects eighteen months from the date of setting to work.

- 9.3. In fixing this period due account has been taken of the time normally required for transport as contemplated in the contract.
- 9.4. In respect of such parts (whether of the Vendor's own manufacture or not) of the material as are expressly mentioned in the contract, the Guarantee Period shall be such other period (if any) as is specified in respect of each of such parts.
- 9.5. The Guarantee period is based on the continuous use of the plant in services for 24 hours every day.
- 9.6. A fresh Guarantee Period equal to that stated in paragraph 2 hereof shall apply, under the same terms and conditions as those applicable to the original material, to parts supplied in replacement of defective parts or to parts renewed in pursuance of this clause. This provision shall not apply to the remaining parts of material, the Guarantee Period of which shall be extended only by a period equal to the period during which the material is out of action as result of a defect covered by this clause.
- 9.7. In order to be able to avail himself of his rights under this clause the purchaser shall notify the Vendor in writing without delay of any defects that have appeared and shall give him every opportunity of inspecting and remedying them.
- 9.8. On receipt of such notification the Vendor shall remedy the defect forthwith and at his own expense. Save where the nature of the defect is such that it is appropriate to effect repairs on site, the purchaser shall return to the Vendor any part in which a defect covered by this clause has appeared, for repair or replacement by the Vendor, and in such case the delivery to the purchaser of such part properly repaired or a part in replacement thereof shall be deemed to be a fulfillment by the Vendor of his obligations under this paragraph in respect of such defective part.
- 9.9. The Vendor shall bear all the costs and risks of the transport of defective parts or equipment's and their replacements.
- 9.10. Where, in pursuance of paragraph 9 hereof, repairs are required to be

effected on site, the conditions covering the attendance of the Vendor's representatives on site shall be such as may be specially agreed between the parties.

- 9.11. Defective parts replaced according to this clause shall be placed at the disposal of the Vendor.
- 9.12. If the Vendor refuses to fulfill his obligations under this clause or fails to proceed with due diligence after being required so to do, the purchaser may proceed to do the necessary work at the Vendor's risk and expense, provided that he does so in a reasonable manner.
- 9.13. The Vendor's liability does not apply to defects arising out of materials provided, or out of a design stipulated, by the purchaser.
- 9.14. The Vendor's liability shall apply only to defect that appears under the conditions of operation provided for by the contract and under proper use. It does not cover defects due to causes arising after the risk in the material has passed in accordance with clause 6. In particular it does not cover defects arising from the purchaser's faulty maintenance or erection, or from alterations carried out without the Vendor's consent in writing, or from repairs carried out improperly by the purchaser, nor does it cover normal deterioration.
- 9.15. Save as in this clause expresses, the Vendor shall be under no liability in respect of defects after the risk in the material has passed in accordance with clause 6, even if such defects are due to causes existing before the risk so passed. It is expressly agreed that the purchaser shall have no claim in respect of personal injury or of damage to property not the subject matter of the contract or of loss of profit unless it is shown from the circumstances of the case that the Vendor has been guilty of gross misconduct.

**9.16.** All defective and/ or not complying materials shall be

Evacuated from

EDCO stores within a maximum of one month by the vender from the date of notifying him. All costs and expenses of transportation shall be borne by the vendor. Unless otherwise agreed.

Otherwise; EDCO has the right to deal with the defective materials in a proper way.

**9.17.** Gross misconduct "does not comprise any and every lack of proper care or skill, but means an act or omission on the part of the Vendor implying either a failure to pay due regard to serious consequences which a conscientious contractor would normally foresee as likely to ensue, or a deliberate disregard of any consequences of such act or omission.

## **10. Relief**

**10.1.** The following shall be considered as cases of relief if they intervene after the formation of the contract and impede its performance: industrial disputes, and any other circumstances (e.g. fire, mobilization, requisition, embargo, currency restrictions, insurrection, shortage of transport, general shortage of materials and restrictions in the use of power) when such other circumstances are beyond the control of the parties.

**10.2.** The party wishing to claim relief by reason of any of the said circumstances shall notify the other party in writing without delay on the intervention and on the cessation thereof.

**10.3.** The effects of the said circumstances so far as they affect the timely performance of their obligation by the parties, are defined in clauses 7 and 8. Save as provided in paragraph 7.5, 7.7, and 8.7, if by reason of any of the said circumstances, the performance of the contract within a reasonable time becomes impossible, either party shall be entitled to terminate the contract by notice in writing to the other part without requiring the consent of any court.

**10.4.** If the contract is terminated in accordance with paragraph 3 hereof, the division of the expenses incurred in respect of the contract shall be determined by agreement between the parties.

**10.5.** In default of agreement it shall be determined by the arbitrator which

party has been prevented from performing his obligations and that party shall bear the whole of the said expenses.

Where the purchaser is required to bear the whole of the expenses and has before termination of the contract paid to the Vendor more than the amount of the Vendor's expenses, the purchaser shall be entitled to recover the excess. If the arbitrator determines that both parties have been prevented from performing their obligation, he shall apportion the said expenses between the parties in such manner as to him seems fair and reasonable, having regard to all the circumstances of the case.

- 10.6. For the purposes of this clause "expenses" means actual out of pocket expenses reasonably incurred, after both parties shall have mitigated their losses as far as possible. Provided that as respects material delivered to the purchaser the Vendor's expenses shall be deemed to be that part of the price payable under the contract which is properly attributable thereto.

#### **11. Limitation of Damages:**

- 11.1. Where either party is liable in damages to the other these shall not exceed the damage which the party in default could reasonably have foreseen at the time of the formation of the contract.
- 11.2. The party who sets up a breach of the contract shall be under a duty to take all necessary measures to mitigate the loss which has occurred provided that he can do so without unreasonable inconvenience or cost. Should he fail to do so, the party guilty of the breach may claim a reduction in the damages.

#### **12. Rights at Termination:**

Termination of the contract from whatever cause arising shall be without prejudice to the rights of the parties accrued under the contract up to the time of termination.

#### **Arbitration and Law Applicable:**

- 13.1. If Any dispute, question or controversy shall arise between the purchaser and the contractor concerning this contract the matter in dispute shall be referred to an arbitration committee composed of three (3) arbitrators

- 13.2.** One arbitrator shall be nominated by the purchaser and one by the contractor, and the third arbitrator shall be appointed by both parties.
- 13.3.** If either party fails to appoint his arbitrator within one month of the appointment of the arbitrator by the other party, or if the two parties fail to agree on the third arbitrator within two months of the date of the request to refer the dispute to arbitration, such arbitrator shall be appointed by the president of the highest court in Jordan at the request of either or both parties.
- 13.4.** The decision of the arbitrators shall be final and binding on both the purchaser and the contractor. Any such reference shall conform to the statutory enactment or regulation governing arbitration as may be in force in Jordan at the time. The assessment of costs incidental to the reference and award respectively shall be at the discretion of the arbitration committee.

## **TENDERING INSTRUCTIONS**

1. The Tender shall be made in one copy of the accompanying form; however, all blanks and schedules shall be filled up in ink, and signed without alteration to the form of tender. If any such alteration were made, or if these Instructions were not fully complied with, the tender may be rejected. The tenderer; however, is at liberty to add any further details that he may deem desirable and, in the event of his so doing, shall print or type such details and annex the added matter to the tender submitted by him. Such additional details shall not be binding upon the purchaser unless they shall be subsequently incorporated in the contract.
2. One copy of the tender, and its accompanying documents, filled up as directed, together with the drawings, catalogs, and relevant documents called for, must be enclosed in a secure envelope endorsed **(Tender for Contract No. (42/2025))**.
3. All correspondences in connection with this tender and all matters accompanying the tender that are relevant to its examination shall be in English language and expressed in metric units.
4. The tender is to be held open for acceptance or rejection for a validity period of (90) days from the time fixed for opening the tenders.
5. Tenders received prior to the time fixed for opening of tenders will be securely kept, unopened. Tenders received after that time will be rejected. The purchaser bears no responsibility for premature opening of tenders not properly addressed or identified.
6. Tenders may be withdrawn by formal request received in writing from the tenderer prior to the time fixed for opening. If for any reason the tender should be withdrawn after the time fixed for opening and before expiry of the said validity period, the purchaser has the right to retain the full value of the tender bond.
7. The successful tenderer shall abide by the commercial and professional regulations as required by the Ministry of Industry & Trade, Engineering Association and other relevant Institutions in Jordan.

8. Tenderers attention is drawn to the action of customs officers in the discharge of their duties. Whereby air parcels are frequently opened In their own interests and in order to preserve the confidential nature of the tender price, tenderers are urged to pay attention to the:
  - a. To dispatch the completed tender document and any covering letter only by Air Mail which should be endorsed and labeled in the manner laid down in paragraph 10 of the Instructions to Tendering.
  - b. Technical literature and the like may reasonably be sent by Air Parcel or Air Freight but since this would then be separated from the actual Tender, each parcel should contain specific evidence identifying the Tender to which the contents refer.
  - c. The purchaser will not consider late or incompletely delivered tenders or literature supporting tenders due to the action of any customs officer.
9. In the event that the intending signatory does not manufacture one or more of the main sections of equipment and materials, then the tender submitted should give evidence to show that all the obligations imposed by the documents on the intending signatory have been fully understood and accepted, where applicable, by the manufacturer(s) to whom it would be intended to sub-contract one or more of the main sections of the equipment and materials.
10. For overseas transport of the contractor and his Sub-contractors, suppliers and manufactures must give priority to Jordan shipping national lines, and to Arab shipping companies and their subsidiaries for the shipping of goods, materials provided such companies ships call at the port of export. The contractor shall also give priority to the Royal Jordanian Airlines for air freight shipment and transport of personnel.
11. Tenderer must submit country of origin and name of manufacturer for the offered goods.
12. The foreign bidders who participate in this tender must submit their bids through a registered local agent or through their registered office in Jordan.
13. For all manufacturers from inside Jordan it is quite essential that they have JQM for their products and the purchaser will have the right to accept or reject their offer if they did not submitted the JQM certificate with their offer.

14. If samples were not re-claimed by the tenderer within one month from date of order all samples shall remain the property of the purchaser.
15. The purchaser will not be responsible for, nor to pay for, any expenses or losses which may be incurred by a tenderer in the preparation of his tender.
16. If the tenderer has any doubt about the meaning of any portion of the General Conditions, Specifications, Drawings, he shall clarify such doubts before submitting his tender, or in case of any further information can be obtained by an application in writing to the director general.
17. Tenderers are particularly directed that the amount entered on the form of tender shall be a fixed price for performing the contract strictly in accordance with the bound document, and shall be the sum total of all the amounts printed into and entered by the tenderer upon the schedule of prices.
18. Tender price shall include all incidental and contingent expenses.
19. The tender shall be accompanied by a tender bond in the form of a Bank Guarantee valid for at least 90 days from the time fixed for opening the tenders or certified check in favor of and payable to the purchaser for a sum of **5% Of Your Offer** \_\_\_\_\_ as a guarantee of good faith. This bond is to be issued by any approved bank in Jordan. The bond will be returned to the unsuccessful tenderer within (90) days from the time fixed for opening the tenders or at such earlier time as a tender shall have been accepted by the purchaser. In the case of the successful tenderer, the bond will, subject to the conditions of contract, be returned as soon as a formal contract agreement and a performance bond have been entered into.
20. The successful tenderer has to submit a performance bond equal to (10%) ten percent of the total amount of the order within (15) days from date of receipt of the order. Any delay will be subject to delay penalty.

If the successful tenderer fails for any reason to submit the required performance bond within (15) days, the purchaser will confiscate the bid bond and the awarding letter will be cancelled too.
21. The performance bond should be valid for a period; expiring at least one month after receipt of the last consignment in EDCO stores.

22. The tenderer shall state in his tender the name or names of the sureties, insurance company, or bank proposed for guaranteeing the performance of the contract.
23. Prices are highly recommended to be on the basis of C&F EDCO STORES. However CFR Aqaba port or Amman customs are also accepted. All prices offered shall be exempted from custom duties, sales taxes, import license fees and any other tariffs.
24. The tenderer may state the tender price in Jordanian Dinars. If however, a portion of the tenderer's expenditure under the contract is expected to be made in countries other than Jordan he may state a corresponding foreign currency portion of the tender price in the currencies of those other countries.
25. Stamp duty and award fees are payable on Jordanian contracts according to Jordanian laws and, after the placing of a contract, it is the contractor's responsibility to purchase legal stamps to the requisite amount depending on the contract value.
26. If after receipt of tenders, the purchaser finds any difference between prices shown on the form of tender in writing and in numerals, then the price shown in writing shall be considered correct by the purchaser and the tenderer. If any discrepancies are found between the total in the price schedule and the total obtained by adding the products of each quantity and its particular rate then, whether the price shown on the form of tender in numerals or in writing corresponds or not, the total obtained by adding the products of the quantities and their particular rates shall be considered by the purchaser and the tenderer as the tender price.
27. Tender evaluation will be consistent with the terms and conditions set forth in the tender document. In addition to the tender price adjusted to correct arithmetical errors, other relevant factors such as the time of completion of delivery or construction, operating costs where applicable, or the efficiency and compatibility of the equipment, the availability of service and spare parts, and reliability of construction methods proposed will be taken into consideration, to the extent and in the manner specified in the tender documents, in determining the evaluated tender most advantageous to the purchaser. For comparison of all tenders, the currency or currencies of the tender price for each tender will be valued in terms of Jordanian Dinars. The

rates of exchange to be used in such valuation will be the selling rates published by the CENTRAL BANK OF JORDAN and applicable to similar transactions, on the day tenders are opened unless there should be a change in the value of the currencies before the award is made. In the latter case, the exchange rates prevailing at the time of the decision to notify the award to the successful tenderer may be used.

28. The purchaser does not bind himself to accept the lowest offers of any tender, nor to assign any reason for the rejection of any tender, nor to purchase the whole of the equipment and materials specified. The purchaser has the right to purchase part of the tender, even if it is only one item from the schedule of rates and prices.
29. The tenderer shall submit with his tender in order of the relevant clauses, a statement of any departures from specifications, or he can fill in the related schedule attached herewith. Notwithstanding any description, drawings, or literature which may be submitted, all details other than those in the statement of departures shall be assumed to be in accordance with the specification.
30. Although IEC standards for workmanship, equipment and materials, have been selected in this specification as a basis of reference, standards and specifications of other countries and recommendations of other international standard organizations will be acceptable provided that they are substantially equivalent to the designated standards and provided

Further that the tenderer submits for approval detailed specification which he proposes to use.

31. References to brand names or catalog numbers, if any, in this specification have been made only for that equipment for which it has been determined that a degree of standardization is necessary to maintain certain essential features. In certain instances such references have also been made for purpose of convenience to specify the requirements. In either case offers of alternative goods which have similar characteristics and provide performance and quality at least equal to those specified are acceptable.
32. Where compliance with a specific standard specification is called for the standard specification used shall be that in force at the time of tender.
33. The Tenderer should submit a type test certificate from independent testing laboratory similar to the Tender materials as an evidence of his capability to

manufacture such materials also to submit a reference list showing his past supply and he should prove that he supplied similar materials to more than one firm and operated for more than 3 years without problems otherwise his offer will not be considered.

34. A nonrefundable fee of (100) JD will be charged for each set comprising one copy of the Tender Documents.

### **TENDER AGREEMENT SUMMARY**

**Tender No. (42/2025)**

**Dear Sir;**

1. Having examined the conditions of Contract, specification and schedule for the above Works, the undersigned, offer to manufacture, supply, work, test, and deliver the said works described in the specification and schedules and in accordance with the said conditions of contract, for the sum of \_\_\_\_\_ or such other sum as may be ascertained in accordance with the said conditions.
2. We agree that this tender shall be held open for acceptance or rejection for the validity period of **(90) days** from the date fixed for opening tenders and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
3. Unless and until a formal agreement is prepared and executed, this tender, together with your written acceptance thereof, shall constitute a binding contract between us.
4. If our tender is accepted, we will deliver to **ELECTRICITY DISTRIBUTION COMPANY**. Within **(15) days** of being called upon to do so a performance bond by bank or insurance company (to be approved in either case by the purchaser) to be jointly and severally bound with us in a sum equal to **10%** of the value of the contract. The form of the performance bond will be as attached hereto. We propose the following Bank or insurance company as surety (or sureties) in this respect:-.....

5. We undertake if our tender is accepted and on receipt of your acceptance to commence and manufacture, works test, and complete for delivery **ex-works** the whole of the Works offered within (——) weeks calculated from the date of **Order Letter Awarding**, and to deliver on the dock at (—— port) - Jordan the whole of the works offered within a further (—— weeks, or to **EDCO stores** within a further (——) weeks.
6. We undertake to insure the materials against all risks from the time they leave the works until they are placed on board ship. We understand that marine insurance will be affected by **ELECTRICITY DISTRIBUTION COMPANY**. And we will provide details of the materials to be shipped in good time for **ELECTRICITY DISTRIBUTION COMPANY** to arrange for the said marine insurance.
7. A guarantee Period will apply to each section of the works of 15 months from the date of dispatch ex-works or 12 months from the date of setting to work whichever shall be later.
8. We understand that you are not bound to accept the lowest or any tender you may receive.

Dated this ——— day of / / 2025.

Signature———— in the capacity of————

Duly authorized to sign Tender for and on behalf of ———

ADDRESS ——— OCCUPATION ———

**ELECTRICITY DISTRIBUTION COMPANY.**

**Form of Bid Bond**

**Tender No. (42/2025)**

**Dear Sir,**

We are pleased to inform you that we guarantee  
M/S \_\_\_\_\_for the amount  
of \_\_\_\_\_in order to allow them to submit an offer  
for the due performance of the undertaking and obligation as specified in their  
Tender for Contract No. \_\_\_\_\_This Guarantee shall remain valid for a  
period of **(90)** days from the time fixed for opening the Tenders by  
**ELECTRICITY DISTRIBUTION COMPANY.**

This Guarantee shall be free from any interest and will be extended or paid in cash upon your first request in any or required, without the need for natural warning or judicial proceedings and without any rights to delay, oppose, or stop payment on our part, or on the part of the Tenderer or any of his representatives whomever.

This Guarantee shall be deemed valid until the submittal of a duly executed Performance Bond.

***Signed*** \_\_\_\_\_ ***Bank (Surety)***

**ELECTRICITY DISTRIBUTION COMPANY.**

**Form of Performance Bond**

**Tender No. (42/2025)**

**Dear Sirs,**

At the request of \_\_\_\_\_ bank (the Foreign Bank)  
and on behalf of M/S \_\_\_\_\_  
(Contractor's Name and Address), we \_\_\_\_\_ Bank (the  
Local Bank) issue in your favor our irrevocable and unconditional Performance  
Bond No. \_\_\_\_\_ in the amount of \_\_\_\_\_  
\_\_\_\_\_(In \_\_\_\_\_ words), in this connection we  
\_\_\_\_\_ Bank (the Local Bank) hereby consider  
ourselves responsible forth unconditional payment to you or to your authorized  
representatives of the above sum on your first written demand in whole or in  
part notwithstanding any objections on the part of the above named contractor  
and without any need for natural warning or judicial proceedings.

This Bond will expire on \_\_\_\_\_ and shall be renewed automatically for  
a period of \_\_\_\_\_ months and for consecutive similar periods until it is  
returned by you to us.

***Signed \_\_\_\_\_ Bank (Surety)***

**ELECTRICITY DISTRIBUTION COMPANY.**

**Form of Maintenance Bond**

**Tender No. (42/2025)**

**M/S. ELECTRICITY DISTRIBUTION CO. (EDCO)  
Amman – Jordan**

At the request of \_\_\_\_\_ Bank ( the foreign bank ) and on behalf of M/S : \_\_\_\_\_ ( The Contractor name and address ), we \_\_\_\_\_ Bank (the local bank) issue in your favor our irrevocable and unconditional maintenance bond No.(\_\_\_\_\_ ) in the amount of \_\_\_\_\_ (In words) valid until \_\_\_\_\_ covering \_\_\_\_\_ PCT value of the \_\_\_\_\_ (Contract No. Name), in this connection we the \_\_\_\_\_ Bank (local bank ), hereby consider ourselves responsible for the unconditional payment to you or your authorized representatives of the above sum on your first written demand in whole or in part notwithstanding any objections on the part of the above named Contractor and without any need for notarial warning or judicial proceedings.

This bond will expire on \_\_\_\_\_and shall be renewed automatically for a period of (\_\_\_\_\_) months and for consecutive similar periods until it is returned by you to us.

***Signed \_\_\_\_\_ Bank (Surety)***

## Main Substations Automation

## 1- Introduction:

This document describes the specifications of the SCADA system equipment that will be installed in Sheidiah NEPCO Substation located in Maan.

The SCADA system equipment will be used to monitor and control the Sheidiah NEPCO Substation from EDCO's control center located in Amman, which uses (ABB brand microSCADA) as the SCADA application master station. (Interoperability list is attached)

The equipment are:

- Remote Terminal Unit (RTU)
- DC system

All the equipment, internal parts and software mentioned in this document shall be released within this year or afterward, especially the batteries.

## 2- Scope of Work:

The contractor is responsible of **supplying and installing** all the equipment that will be used to monitor and control the substation from EDCO's control center, according to the technical specifications in this document.

The contractor is responsible to study and analyze this tender specification carefully, any missed equipment or works that is not mentioned in this document that may help to enhance the main functionality, the contractor is obligated to include it in his offer.

All cables, wires, power supplies, terminals, MCBs, that may be needed to fully operate the equipment shall be included in the offer.

Any cables, wires, terminals, or any other equipment to be installed shall be clearly labeled.

Expected works in this project are:

- 1- Supply, install and configure the RTU.
- 2- Supply and install the DC system, all needed accessories such as (power wires with all different sizes, terminals, MCBs, lugs, copper glands...) shall be included in the offer.
- 3- Supply and install CAT6A 500m drum.
- 4- Install the transducers that are supplied by EDCO, all needed accessories such as (wires terminals, MCBs, lugs, copper glands...) shall be included in the offer.
- 5- Testing and commissioning of the whole system and perform the point-to-point test with the control center.
- 6- Include an intensive training.
- 7- Supply a laptop.
- 8- Provided any needed licenses.
- 9- Provide the mentioned manuals and documents.
- 10- Supply the mentioned spare parts.

**ALL THE ACCESSORIES NEEDED FOR THE INSTALLATION PROCESS SHALL BE INCLUDED IN THE OFFER.**

**THE CONTRACTOR IS OBLIGATED TO PROVIDE IT AT THE TIME OF THE INSTALLATION EVEN IF THE ACCESSORIES ARE NOT INCLUDED IN THE OFFER.**

### 3- Data Acquisition and Control:

The input and output data between the RTU and the SWG shall be transmitted **using hardwiring** where all the Status and Commands (binary I/O), shall be connected to the I/O modules of the RTU using control wires. All necessary wiring shall be performed by the contractor.

All the analog measurements shall be transmitted from the transducers, using Modbus over serial (RS485), The transducers are not installed in the SWG, **(EDCO will provide the transducers and the contractor shall install them)** all necessary wirings, configurations and settings shall be performed by the contractor, transducers type is (ABB 560CVD03).

### 4- General Requirements:

- **Codes and Standards:**

The following codes and standards shall be complied.

- a- **General codes and standards:**

The equipment's, components and installation shall comply with relevant laws, bylaws, rules, recommendations, and to the relevant specifications of the latest editions from standards and certified by accredited signature of ILAC-MRA (International Laboratory Accreditation Cooperation-Mutual Recognition Arrangement).

Where codes or standards are not specifically mentioned in the technical specifications, materials, tests at works, tests at site, installation methods, and manufacturing methods shall conform as a minimum to applicable codes and standards selected from the following:

Standardization by	Construction/Installation
IEC (International Electro technical Commission)	Electrical equipment and electrical Installations
CEE (Commission Electrical Equipment)	
EN	
ITU (International Telecommunications Union)	Communication Network
TIA -942-A	Telecommunication Infrastructure Standard for Data Centers
CENELEC (Comité Européen de Normalisation Electrotechnique)	Electromagnetic Compatibility, cables
Eurocode, British Standards (BS)	Site Investigations, Testing Aggregates, Foundations, Civil Works, Earthquake
BS or DIN/VDE	Steel construction/structures
DIN/VDE	Galvanising
IEC, DIN (Deutsche Industrie Norm) VDE (Verband Deutscher Elektrotechniker)	Lightning arresters
IEEE Std. C37.90.2-1987	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

In case of conflict or disagreement between the particulars of the standard specification adopted by the tenderer and the particulars of this specification, this specification shall prevail over the standard specification. All conflicts or disagreements, mentioned above, must be clearly stated, failing which the materials and equipment's offered shall be

deemed to comply in every respect with this Specification both in manufacture and in performance, and compliance thereof be insisted upon without additional cost to the employer.

**b- Alternative codes and standards:**

If the Tenderer wishes to base his proposal on codes or standards other than those specified, he may do so, provided that he submits with his proposal complete data with respect to the codes or standards forming the basis of his offer and confirms in his offer that such codes or standards meet, as a minimum, the specified Codes and Standards listed above. The Tenderer shall submit, as a part of his proposal, a tabulated list of the differences between the Codes and Standards in his offer and those specified herein. The decision to accept such alternative codes or standards shall rest with the Employer on the basis of his evaluation of, but not limited to, the following:

- The material and/or equipment are equivalent to or better, in characteristics, analysis or construction.
- The material and/or equipment shall meet all test requirements prescribed in the specified code or standard.

Attention is drawn to the climatic and environmental conditions in the Project Area as well as the altitude above the sea level and, where applicable in the codes and/or standards, a suitable de-rating factor must be applied. He shall indicate in his tender where such de-rating has been employed and shall, in each instance, cite the value of the factor. The successful Tenderer will, in due time, have to prove that his material and/or equipment comply with all the requirements of this subsection, such proof being part of the successful meeting of tests and inspections witnessed by the Employer and/or Inspector/engineer.

- **System of Units:**

The International System of Units (metric system) as specified in IEC shall be used throughout the Contract.

- **Control and Power wires and cables:**

The specifications cover the design, of the control cables for the signals that are going to be internally connected inside the RTU and the DC system.

A 1.1 KV grade PVC insulated armored stranded copper with sizes to be from 0.5mm<sup>2</sup> - 1.5mm<sup>2</sup>, according to the usage. The control wires are required to connect the SCADA signals internally inside the RTU and the DC system. All materials by this specification shall comply with the applicable provisions of the latest edition of IEC 60502 standards.

## **5- Particular Specifications:**

- **Remote terminal unit (RTU):**

- a- **General:**

The RTU shall be well known brand, modular type, new and of latest make and type available. It shall be consisted of cards/modules mounted on a rack inside a separate panel. All the I/O cards/modules shall be connected to knife type terminals that are clearly numbered to interface with the SWG.

Its design shall be based on standardized hardware and software. It shall be provided with an extensive self-test and monitoring system. All essential functions shall be monitored, e.g., prospective cooling system (fans), program executions, memories, etc. In case of a detected fault a local alarm shall be generated via a potential free contact and transmitted to the control center. In case of disturbances in the power supply the RTU shall shut down. When the voltage recovers, it shall automatically restart.

**b- Data Transmission:**

Data transmission between RTU and control center shall use standard communication channels provided by EDCO.

The communication between the RTU and the Control Center shall be via IEC 60870-5-104 protocol.

For serial communication with local IEDs (transducers) transmission speed shall be selectable in the range of 2400 bps or higher according to the protocol used.

Modbus protocol shall be used to transfer measurement data from transducers supplied by EDCO to the RTU through RS485 port.

**c- RTU features:**

The overall features of the RTU shall be as follows:

- Operate as a gateway between IEDs and EDCO's control center using different SCADA protocols
- Capability to accept a "poll" or "request" message and respond by a "reply" message.
- Capability to operate in quiescent mode where the RTU initiates the transfer of data when it detects a status change or analogue change outside of dead band
- High degree of security to prevent erroneous remote control or acquisition of inaccurate data
- Flexible capacity to adapt to different communication protocols such as Modbus, DNP3, IEC 60870-5-101/104, IEC61850... etc.

The protocols available for RTU's and for communicating with substation IED's shall be listed in the Tender.

- For the measurements that are transmitted over Modbus the RTU shall be able to read all possible data types (32bit (signed unsigned), 16bit (signed, unsigned), float, single bit,...).
- At least the following ports shall be available:
  - 2 Ethernet ports, other than the ports used to interface with the IEDs if applicable.
  - 2 serial ports RS485.
- Capability to detect events with time resolution of 1 ms or better.
- Capability of "cyclic" or "by exception" analogue and status data requests. Provision to adjust cycle times for each data
- For RTUs which incorporate reporting "by exception", a status scan will automatically be initiated whenever the status changes or the value is changed beyond a defined band
- High performance central processing units
- Capability to set parameters locally or remotely
- Time synchronization via GPS, NTP or time synchronization supported by some SCADA protocols (such as IEC104).
- Capable to operate satisfactorily in non AC environment within temperature range of -10 to +75 deg C, relative humidity of 5% to 95%.
- The RTU shall be configured using a user friendly configuration tool, that can be installed on a laptop.

If a license is required, then the contractor shall provide a license for at least 2 laptops

The connection to the RTU through the tool must be done remotely from the control center or locally from the substation.

- Along with the configuration tool for offline configuration, access through webpage to the RTU shall be available either locally or remotely. Through this webpage the RTU shall be diagnosed and monitored.
- The RTU shall have the ability to be diagnosed through a webserver application, that can be connected remotely from the control center.
- LED indications on the digital input modules to indicate the On-Off status of the digital input data, 1 LED per input point.
- contact bounces and operation time for circuit breakers, isolators and earth switches shall be suppressed
- spikes, power and higher frequency signals shall be suppressed
- the command sequence shall be (selectable) carried out by single-step or two-step procedure with check-back
- the output pulse length shall be selectable 0.1 up to 9 sec
- All process input/output signals shall be protected for over voltage and other disturbances according to IEC 255- 4 or better.
- The RTU shall support cyber-security features according to IEC62351 and IEEE1686.

**d- Sequence of Events Recording:**

Sequence of events (SOE) recording software supported by appropriate hardware shall be provided. The SOE facility shall be able to detect, time stamp and store in the RTU, the status changes in selected input channels and subsequently transmit this information to the control center. The SOE information, along with the details of the involved input channel, shall be stored in chronological order in a sequence of events list, which shall be separate from the normal events list. Events shall be time tagged to a resolution of 1 ms or better within the RTU and to a resolution of better than 20ms system wide. The central system shall periodically synchronize RTU's internal clock with the time subsystem at the control center. Synchronizing of the RTU clocks shall be compensated for the effect of transmission time delays.

**e- Sizing:**

This substation consists of 6 Outgoing feeders, each feeder has the following I/O:

- 4 **double point** digital **input** per feeder.
- 5 **single point** digital **input** per feeder.
- 1 **double point** digital **output** per feeder.
- 1 **single point** digital **output** per feeder.
- 6 **single point** digital **input** for whole substation.

The number of the signals transmitted using the main method (from IEDs) shall be unlimited, and can take as much as the IED can send.

The other signals that will be transmitted using the secondary method, shall be as follows including 20% extra spare points:

- 100 DI points
- 22 DO points

The contractor shall supply RTU with sufficient capacity for the number of I/O points mentioned above.

- **Auxiliary Power supply:**

**a- General:**

The auxiliary power system shall consist of charger, batteries, main battery fuse board and DC distribution board. MCB's shall be installed for AC and DC circuits.

**The batteries shall be installed inside a special cubicle separated from the charger, and is shall be equipped with cooling and ventilation equipment.**

**Both the batteries cubicle and the charger shall be separated from each other because they will be installed in separate rooms in the SS.**

The system shall be designed for the power demand of the connected loads and a future extension of at least 30 %, taking into account the load diversity factor and the maximum voltage drop.

The power supply shall be able to supply the RTU with all the digital I/O voltages needed as well as supply the communication equipment (supplied by EDCO).

**b- Charger:**

The DC output levels of the charger shall be (110, 48 and 24 VDC) to supply the RTU and the communication equipment.

The contractor may use DC/DC converters to provide the (48 and 24 VDC) voltages, where the converters capacity shall be sufficient.

The charger shall be designed to recharge the batteries, up to 90 % of rated C10-capacity within 12 hours after a six-hour discharge, whilst supplying the connected loads at the same time, without affecting battery lifetime.

The voltage at individual components when the system is at no load must not exceed the nominal voltage by more than 10 %, and must not fall below the nominal voltage by more than 15 % when the system is at full load.

The charger shall be equipped with volt- and ampere-meters (accuracy class 0,2), indication lamps, main switch, and a selector switch for automatic recuperative recharging (Float/Quick charge with locking device) as well as alarm indicators for AC supply failure, and quick charging. Test outlets for 4mm test lead plugs shall be provided.

Auxiliary contacts for alarms shall be provided for remote alarms, including a no-voltage relay for AC voltage.

DC-supervision of the battery system shall be included, and shall as a minimum consist of:

- Over- and under-voltage supervision in two steps for each function of the floating voltage level.
- Earth fault supervision.
- Battery circuit supervision.
- MCB supervision for all MCB's
- Over temperature alarm.

If the DC-supervision is mounted in the charger it has to be connected at the external side of the charger fuse to prevent mal-operation if the fuse will trip.

The charger shall be equipped with an LCD screen to:

- monitor the status of the charger modules and batteries
- view and read any alarm

**c- Batteries:**

**The batteries shall be released within this year or afterward.**

They shall be of maintenance free gel type erected stacked in cubicles on non-corrosive stands and totally insulated from frames and earthed equipment. The

battery must be erected in such way that maintenance and service easily can be carried out.

Each battery should be (120 Ah) capacity for maintaining the power supply at full load for a period of 8 hours in the event of failure of the AC supply.

For discharge test of batteries, a portable enclosed resistor and a fused test outlet at the DC board shall be supplied. It shall be possible to adjust the resistor for different load current.

**d- Load calculations:**

The DC system is expected to supply the following loads:

	Voltage required	Current consumed	Connected Loads
RTU	To be determined by the contractor	To be determined by the contractor	- RTU modules supply - Indications and commands
Communication Equipment	- 24VDC - 48VDC - 220VAC	- 10A - 10A - 10A	- RuggedCOM switch RX1500 - Racom RiPEX UHF system

## 6- Measurements:

All the measurements shall be transmitted via Modbus over RS485 serial communications, where a transducer shall be connected to the RTU and transmit the required measurements through Modbus RTU.

The transducers type is (ABB 560CVD03), where they will be provided by EDCO, and installed by the contractor.

The SWG already includes CTs and VTs, the contractor is responsible to install the transducers and connect them to the CTs, VTs and the supply voltage inside the SWG, where any required wires, terminals, lugs, glands, MCBs might be needed shall be supplied by the contractor.

The transducers shall be connected to the RTU using a CAT6A cable. The contractor shall supply a 500m drum CAT6A shielded cable to perform these works.

The Voltages from the VTs shall be connected to 2A MCBs before being connected to the transducer in parallel with any instruments connected in the SWG.

The currents from the CTs shall be connected directly to the transducers in series with any instruments exists in the SWG.

After all the installations are done in the SWG the contractor shall modify the SWG drawings accordingly.

## 7- Wires and cables:

All the cables that are going to be installed between cubicles shall be Armored and to be entered to the cubicle through a copper glands with a suitable size to the cable.

The required cables and wires to be supplied and installed are as follows:

- Armored cable to connect the Batteries to the Charger shall be at least 3\*6mm<sup>2</sup> (positive, negative and ground), Including all required copper glands, lugs and terminals.
- Armored cable to connect the AC power to the Charger, shall be at least 3\*6mm<sup>2</sup> (Line, Neutral and ground), Including all required copper glands, lugs and terminals.
- Set of armored cables to supply the communication equipment at least 3\*2.5mm<sup>2</sup> including all required copper glands, lugs and terminals.
- Set of colored wires 2.5mm<sup>2</sup> to connect the CTs and VTs to the transducers and to supply the

- transducers with the operating voltage including all required glands, lugs and terminals.
- CAT6A shielded cable 500m drum to connect the Modbus data from transducers to the RTU.

## **8- Testing and Commissioning:**

- **General:**

Factory tests on equipment shall be made according to the applicable IEC Standards, or as specifically specified or according to standards approved by the Employer.

Routine tests shall be made on each unit of all equipment.

The Employer shall be at liberty to demand any additional testing at the manufacturer's works, at site or elsewhere in order to verify that the equipment complies with the conditions of the Specifications. Any such testing should be at the Contractor's expense.

A program of all tests in the factory and at Site is to be mutually agreed upon between the Contractor and the Employer.

- **Factory Acceptance Test (RTU):**

Before packing or dispatching, factory acceptance tests shall be carried out on all RTUs.

The features that shall be subject to FAT shall include:

- a- Test on all I/O points (including single and two-bit indications, analogue inputs, digital outputs, analogue outputs, tap position indications, etc.)
- b- Test expansion capability of a minimum equipped RTU by addition of I/O cards up to its full expansion capacity
- c- verification of communications capabilities including single and dual communications configurations
- d- Downloading and parameterization of RTU software

It is not envisaged that the Employer will witness all RTU FATs. However, before the first batch of RTUs is shipped a FAT shall be carried out on a representative number of RTUs, which shall include all types, and configurations of RTUs being proposed under this Contract. The Employer, or his representative, may witness this test (and any others) at his discretion.

- **Site Acceptance Test (SAT):**

The Contractor shall carry out commissioning and testing at site of the works specified in the Specifications.

The contractor shall provide all staff, such as engineers, supervisory staff, skilled and unskilled labour necessary to carry out the site tests on schedule as specified. Information regarding site staff shall be shown in the Tender.

A site inspection and test program shall be submitted to the employer for approval at least 1 month ahead of the commencement of testing.

Testing at site shall be carried out by experienced test engineers. Functional tests shall be inherent in all test procedures. The Contractor shall record the test results in an approved form in such a manner that the test reports can be used as the basis for future maintenance tests. Test methods and equipment shall be noted on the test sheets. Any correction to be done at site should be subject to approval by the Employer

A complete test report in 3 sets shall be handed over to the Employer not later than one month after the Works being commissioned. The test engineers shall at site keep a complete record of correction made during testing and one set of corrected drawings shall be kept at site after commissioning and one set handed over to the Employer.

- **Point to Point Test:**

Point to Point Test will be carried out by the employer in the presence of the contractor's engineers, where each SCADA signal shall be tested separately in the control center. The contractor shall prior to the test draw up a detailed schedule for approval showing the sequence to follow step by step.

- **Type Tests:**

Type tests shall be made on one unit of each type of different equipment. Instead of carrying out the type tests the Contractor may submit suitable certificates of tests made on equipment of the same type; however, the Employer reserves the right of accepting these certificates or to reject them partially or totally.

## **9- Training:**

- **General:**

The contractor shall include a proposed training program in his tender. The training shall include classroom type training and on-the-job training.

- **RTU training:**

A training session shall be held by the contractor with at least the following topics:

- a- Intensive training on the configuration tool of the RTU.
- b- On job training on how to configuring the RTU from scratch including all parameters.
- c- Changing the communication parameters of the RTU.
- d- Installing new firmware for the RTU
- e- Handling all the communication ports.
- f- Hardware diagnostics for the RTU and how to replace a module.

- **DC charger Training:**

A training session shall be held by the contractor with at least the following topics:

- 1- Introduction about the charger and the batteries.
- 2- diagnostics of the Charger and the battery.

## **10- O&M Manuals:**

- **General:**

Operation and maintenance manuals provided by Tenderer to the Employer shall describe in detail, the procedure and the operating instructions for the equipment and for measuring devices. The manuals shall contain a comprehensive description of the relevant portion of the Work including all data such as ratings, weights, dimensions etc.

Contractor shall provide three (3) copies of the Operation and Maintenance manuals, stamped "Approved", and one electronic file to the Employer.

- **Content of the Manuals:**

Manuals shall contain assembly methods, a commissioning guide including settings, adjustment, operation and disassembly of every component, system or machine, which shall be described and illustrated in detail. Manuals shall also include a trouble-shooting procedure to locate defective parts rapidly. For preventive maintenance purposes, manuals shall include a list of verification points with visual marking and measurements. For software, manuals shall include descriptions of the software structure, software and database implementation, operating procedures, user interface description and any other descriptions necessary to use, support and troubleshoot the software.

Maintenance instructions and recommended frequency for inspection of every component shall be described in the manuals.

Contractor shall submit manuals that are clear, fully detailed and easily understood, to ensure the appropriate operation and maintenance of the equipment.

### **11- Laptop:**

A laptop shall be included in the offer according to the following specifications:

- 1- 13th generation core I5 or higher
- 2- 8GB RAM or higher
- 3- Windows 11
- 4- 1 TB SSD hard desk or higher
- 5- Long term battery
- 6- Light weight
- 7- Back bag to be included

### **12- Spare Parts:**

The following spare parts shall be provided by the contractor:

No.	Item	Qty (Pcs)
1-	DI module	2
2-	DO module	1
3-	Aux Relays (if applicable in DO circuit)	15
4-	Knife type terminals	50
5-	CPU module	1
6-	Power supply module	1

## Appendix

### Schedule A: Specifications: -

	RTU		
Supply Voltage			
	Supply Voltage Value		
	Permissible variation in voltage level		
General Specification			
	Time synchronization method	GPS/NTP	
	Time synchronization period		
	Communication protocol	IEC 60870-5-104 IEC 60870-5-101 Modbus Serial & TCP/IP DNP3 over TCP/IP IEC 61850	
	Diagnostic LED	Yes	
	Operating Temperature	-10°C-+75°C	
	Real time clock resolution	1 ms	
	Execution cycle time	1 ms	
	Number of serial ports and types	2 RS485	
	Baud rate supported	Min. 2400 bit/s and higher (adjustable)	
	Number of Ethernet Port (other than ports for collecting data from the relays)	2	
	CPU Watchdog	Yes	
	Spikes, power and higher frequency signals shall be suppressed	Yes	
	Output pulse length shall be selectable 0.1 up to 9 sec	Yes	

	Capability to accept a “poll” or “request” message and respond by a “reply” message	Yes	
	Analog values can be reported cyclically or by exception	Yes	
	Supports cyber-security features according to IEC62351 and IEEE1686	Yes	
	RTU Type Test Certificate		
	RTU Test equipment/tool		
	Dimensions		
	IP		
	Manufacturer		
	Origin		
	Modular design and scalable	Yes	
	Special user-friendly tool for RTU configuration, including any required license.	Yes	
	Availability to access the RTU through webpage for diagnosis and monitoring.	Yes	
	Integration with ABB SYS600 SCADA	Yes	
	Long term life cycle and global support	Yes	
<b>DI module</b>			
	Number of input points	100	
	Number of input channels per module		
	Nominal input voltage		
	Max. Input voltage		
	Availability of events time stamping	Yes	
	Time resolution for SOE events	1 ms	
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 2$ KV	
	Short Circuit Protection	Yes	
	Filter	Yes	
<b>DO module</b>			

	Number of output points	22	
	Number of output channels per module		
	Type of contact		
	Max. switching voltage		
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 2$ KV	
	Output closure time range	0.5ms – 30s	
	Short Circuit Protection	Yes	

DC system			
DC Charger (in A Separate Enclosure)			
	Manufacturer		
	Country of origin		
	Rated input voltage	240 V AC	
	Rated output voltage	110V, 48V and 24 V DC	
	Rated output current	Not less than 10A for each output voltage level	
	Degree of protection of the Charger's Enclosure (IP)	IP43	
	Standard		
	Description / Catalogue		
Batteries Group (in A Separate Enclosure)			
	Manufacturer		
	Country of origin		
	Type	Sealed, gel, stacked in separate cubicle	
	Number of cells	6	
	Rated voltage/Battery	12V DC	
	Rated capacity	120 Ah	
	Capacity 8h		
	Number of batteries	9	
	Float charging voltage	13.6 to 13.8 VDC/unit Average at 25°C	
	Battery supervision / alarm included	Yes	
	Internal resistance ( $\Omega$ )		
	Ambient temperature °C		
	Short Circuit Current (A)		
	Dimensions of each battery complete (LxWxH) mm		
	Self-discharge (25°C)		

	Designed life		
	Standard		
	Description / Catalogue		
	Degree of protection of the Batteries Enclosure (IP)	IP43	

## SCHEDULE A

### PROCUREMENT, DESIGN, MANUFACTURE, INSPECTION, TESTING, DELIVERY AND COMPLETION DATES

This schedule shall be completed by the Tenderer to show the time, calculated from the date of award of contract. In which he guarantee to dispatch ex-work of varies sections of the plant and equipment. The time given shall be binding on the contractor except is as far as they may be varied by agreement with the purchaser.

The times quoted for the main items of plant and equipment shall apply equally to all associated and ancillary equipment...etc. necessary to completely deliver the plant ready for shipment.

Target date for completion delivery C&F for all equipment under this contract should be earlier than 26 weeks from the date of the contract award & further 2 weeks for erection testing and commissioning. Otherwise, the offer may be not considered if the delivery time is longer.

**RTU, DC Charger, & Marshalling Panel**

Note: All time periods are weeks from date of Contract Placement.

DESCRIPTION	DELIVERY PERIOD	COMMENTS
- Time within which The Whole <u>Base Design Package</u> (General Arrangement Drawings, Bill-Of-Quantity, Diagrams, Sample Drawings, etc) shall be submitted for Review & Approval		
- Time within which the Base Design Package should be Reviewed By EDCO Enabling the <u>Release For Manufacturing Certificate issuance</u> .	Two (02) Weeks	From the date of duly Handing-Over to EDCO Office.
- Time within which The Whole <u>Detailed Design Package</u> (all wiring and cable drawings/schedules, feruling list, Inspection & Test Plan – ITP – Catalogs, etc) shall be submitted.		
- Time within which the Detailed Design Package should be Reviewed By EDCO.		Does not Disrupt materials ordering and primary manufacturing.

- Time within which equipment & Material shall be available for final inspection and testing at manufacturer's premises ( <u>Invitation to FAT date</u> ).		Notice for FAT Readiness shall be advised to EDCO's attention, at least Twenty One (21) days prior to FAT date.
-Duration of FAT.	Five working days	Estimated for contractual use only, and might be different in fact.
- Duration of FAT report review by EDCO.	Two (02)Weeks	From the duly date of submitting to EDCO.
-Duration of Freight. Road Freight: Overseas/Ocean :		Estimated for contractual use only.
- Time within which all materials shall be delivered.		As per Incoterms 2000 definitions, & DOR.
- Time within which the complete installation erection, testing and commissioning works at site; setting to work shall be completed.		Giving that the site is in the Sheidiah in Maan, South of Jordan
-Total time required for complete work.		Considering/Including EDCO's Review Time

## SCHEDULE B

### MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING

Tenderers shall state the town and country where manufacture, testing and inspection are to take place.

Tenderers shall state the town and country where manufacture is.

DESCRIPTION	Manufacturer	Place of Manufacturer
<u>RTU</u>		
<u>DC Charger</u>		
<u>Batteries</u>		
<u>Cables and wires</u>		
<u>MCBs</u>		
<u>Terminals</u>		

- All above equipment should be of pioneer manufacturers and subject to EDCO approval.

## **SCHEDULE C**

### **PRICES FOR PLANT AND EQUIPMENT**

#### General

The prices below for various items, whether or not the items are fully described, shall include everything necessary to provide the equipment complete and in working order in accordance with the provisions of the contract.

Tenderers and their manner shall fill in the following schedule completely and without omissions, and breakdown may not be changed. However, extra sheets may supplement this schedule if this were necessary.

#### 1. DEFINITE WORK FOR A PRICE BREAK DOWN BASIS

	Description	Currency .....			
		Qty.	F.O.B Unit	Freight Unit	Total Price C&F Aqaba
<b><i>SECTION2: SCADA Equipment</i></b>					
a-	RTU Panel (including all cards, modules, internal wirings, terminals, MCBs, labeling, and licenses)	1			
b-	RTU configuration software including required license for 2 different laptops	1			
c-	DC Charger for SCADA including: Rectifier, Batteries and DC/DC Converter.	1			
d-	Installation, and erection works at site for all the equipment (RTU, DC and Transducers) including configuration, and any necessary materials and accessories may be needed for the installation works like (Terminals, MCBs, Copper Glands, Lugs,...)				

e-	CAT6A 500m Drum	1			
f-	Armored cable 3*6mm <sup>2</sup>	200m			
g-	Armored cable 3*2.5mm <sup>2</sup>	200m			
h-	2.5mm <sup>2</sup> wire rolls (Red, Yellow, Blue, Black and Green)	5 rolls			
i-	Training on the RTU and DC system				
j-	Laptop	1			
k-	Testing and commissioning works at site including Site Acceptance Test and Point to Point test	1			

**Price break down should be included in the offer for all elements and devices.**

**SCHEDULE D**  
**QUANTITIES AND PRICES FOR MANDATORY SPARES**

The Tenderer shall complete this schedule. The Tenderer shall furnish a complete list of spares with break-down of prices recommended which may or may not in whole or in part be purchased by the purchaser under the contract.

The costs of these items shall be included in the Summary of Prices (Schedule L) under the Provisional items.

Qty	Description	Currency .....		
		F.O. B Unit	Freight Unit	Total Price C&F Aqaba
2	DI Module.			
1	DO Module.			
15	Aux Relays.			
50	Knife type terminals.			
1	CPU Module.			
1	Power Supply Module.			
TOTAL OF SCHEDULE D				

## SCHEDULE E

### DEPARTURE FROM SPECIFICATION

All deviations should be listed, in case it is not the equipments will be considered complying our specifications, mandatory departures will not be accepted nor paid for.

Item No.	Departure from specification

## **SCHEDULE (F)**

### **List of References in Main Substations**

<b><u>PROJECT</u></b>	<b><u>COUNTRY</u></b>	<b><u>YEAR</u></b>

Similar tested project in (Main Substations) is an advantage

## 1- Introduction:

This document describes the technical specifications of an RTU

All the materials, internal parts and software mentioned in this document shall be released within this year or afterward.

## 2- Scope of Work:

The contractor is responsible of **supplying** the required RTU that will be used to monitor and control a substation from EDCO's control center, according to the technical specifications in this document.

Expected works in this project are:

- 1- Supply the RTU.
- 2- Include an intensive training.
- 3- Supply a laptop.
- 4- Provided any needed licenses.
- 5- Provide the mentioned manuals and documents.
- 6- Supply the mentioned spare parts.

## 3- Data Acquisition and Control:

The input and output data between the RTU and the SWG will be transmitted using two methods main and redundant:

- 1- Main method (using protocol IEC 61850):

The RTU will behave as gateway between the Substation and the Control Center, where the RTU will be connected to all the protection relays in the substation to transmit the I/O signals between the SWG and the RTU using protocol IEC 61850.

All required software, hardware or licenses to enable the IEC 61850 protocol, shall be provided by the contractor.

All required training shall be provided by the contractor (*see sec. 7: Training*)

The method for collecting the data from the Relays can be either by using an Ethernet extender module in the RTU as a first option or by using a communication switch (supplied by the contractor) with a sufficient number of ports, if the RTU does not support Ethernet extender module.

- 2- Redundant method (using hardwiring):

All the binary signals shall be connected to the I/O modules of the RTU, through the marshalling box using control wires specified in this document.

All the analog measurements shall be transmitted from the transducers installed in the SWG to the RTU using Modbus over serial (RS485).

Normally the data acquisition and control functionalities shall be performed using the main method, unless some failure occurred, then the redundant method shall be used.

The process of converting between the main and redundant method shall be performed remotely.

#### 4- General Requirements:

- **Codes and Standards:**

The following codes and standards shall be complied.

a- **General codes and standards:**

The equipment's, components and installation shall comply with relevant laws, bylaws, rules, recommendations, and to the relevant specifications of the latest editions from standards and certified by accredited signature of ILAC-MRA (International Laboratory Accreditation Cooperation-Mutual Recognition Arrangement).

Where codes or standards are not specifically mentioned in the technical specifications, materials, tests at works, tests at site, installation methods, and manufacturing methods shall conform as a minimum to applicable codes and standards selected from the following:

Standardization by	Construction/Installation
IEC (International Electro technical Commission)	Electrical equipment and electrical Installations
CEE (Commission Electrical Equipment)	
EN	
ITU (International Telecommunications Union)	Communication Network
TIA -942-A	Telecommunication Infrastructure Standard for Data Centers
CENELEC (Comité Européen de Normalisation Electrotechnique)	Electromagnetic Compatibility, cables
Eurocode, British Standards (BS)	Site Investigations, Testing Aggregates, Foundations, Civil Works, Earthquake
BS or DIN/VDE	Steel construction/structures
DIN/VDE	Galvanising
IEC, DIN (Deutsche Industrie Norm) VDE (Verband Deutscher Elektrotechniker)	Lightning arresters
IEEE Std. C37.90.2-1987	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

In case of conflict or disagreement between the particulars of the standard specification adopted by the tenderer and the particulars of this specification, this specification shall prevail over the standard specification. All conflicts or disagreements, mentioned above, must be clearly stated, failing which the materials and equipment's offered shall be deemed to comply in every respect with this Specification both in manufacture and in performance, and compliance thereof be insisted upon without additional cost to the employer.

b- **Alternative codes and standards:**

If the Tenderer wishes to base his proposal on codes or standards other than those specified, he may do so, provided that he submits with his proposal complete data with respect to the codes or standards forming the basis of his offer and confirms in his offer that such codes or standards meet, as a minimum, the specified Codes and Standards

listed above. The Tenderer shall submit, as a part of his proposal, a tabulated list of the differences between the Codes and Standards in his offer and those specified herein. The decision to accept such alternative codes or standards shall rest with the Employer on the basis of his evaluation of, but not limited to, the following:

- The material and/or equipment are equivalent to or better, in characteristics, analysis or construction.
- The material and/or equipment shall meet all test requirements prescribed in the specified code or standard.

Attention is drawn to the climatic and environmental conditions in the Project Area as well as the altitude above the sea level and, where applicable in the codes and/or standards, a suitable de-rating factor must be applied. He shall indicate in his tender where such de-rating has been employed and shall, in each instance, cite the value of the factor. The successful Tenderer will, in due time, have to prove that his material and/or equipment comply with all the requirements of this subsection, such proof being part of the successful meeting of tests and inspections witnessed by the Employer and/or Inspector/engineer.

- **System of Units:**

The International System of Units (metric system) as specified in IEC shall be used throughout the Contract.

- **Control and Power wires and cables:**

The specifications cover the design, of the control cables for the signals that are going to be internally connected inside the RTU.

A 1.1 KV grade PVC insulated armored stranded copper with sizes to be from 0.5mm<sup>2</sup> - 1.5mm<sup>2</sup>, according to the usage. The control wires are required to connect the SCADA signals internally inside the RTU. All materials by this specification shall comply with the applicable provisions of the latest edition of IEC 60502 standards.

## **5- Particular Specifications:**

- **Remote terminal unit (RTU):**

- a- **General:**

The RTU shall be well known brand, modular type, new and of latest make and type available. It shall be consisted of cards/modules mounted on a rack inside a separate panel. All the I/O cards/modules shall be connected to knife type terminals that are clearly numbered to interface with the SWG.

Its design shall be based on standardized hardware and software. It shall be provided with an extensive self-test and monitoring system. All essential functions shall be monitored, e.g., prospective cooling system (fans), program executions, memories, etc. In case of a detected fault a local alarm shall be generated via a potential free contact and transmitted to the control center. In case of disturbances in the power supply the RTU shall shut down. When the voltage recovers, it shall automatically restart.

- b- **Data Transmission:**

Data transmission between RTU and control center shall use standard communication channels provided by EDCO.

The communication between the RTU and the Control Center shall be via IEC 60870-5-104 protocol.

For serial communication with local IEDs (transducers) transmission speed shall be selectable in the range of 2400 bps or higher according to the protocol used. Modbus protocol shall be used to transfer measurement data from transducers supplied by EDCO to the RTU through RS485 port.

**c- RTU features:**

The overall features of the RTU shall be as follows:

- Operate as a gateway between IEDs and EDCO's control center using different SCADA protocols
- Capability to accept a "poll" or "request" message and respond by a "reply" message.
- Capability to operate in quiescent mode where the RTU initiates the transfer of data when it detects a status change or analogue change outside of dead band
- High degree of security to prevent erroneous remote control or acquisition of inaccurate data
- Flexible capacity to adapt to different communication protocols such as Modbus, DNP3, IEC 60870-5-101/104, IEC61850... etc.  
The protocols available for RTU's and for communicating with substation IED's shall be listed in the Tender.
- For the measurements that are transmitted over Modbus the RTU shall be able to read all possible data types (32bit (signed unsigned), 16bit (signed, unsigned), float, single bit,...).
- At least the following ports shall be available:
  - 2 Ethernet ports, other than the ports used to interface with the IEDs if applicable.
  - 2 serial ports RS485.
- Capability to detect events with time resolution of 1 ms or better.
- Capability of "cyclic" or "by exception" analogue and status data requests.  
Provision to adjust cycle times for each data
- For RTUs which incorporate reporting "by exception", a status scan will automatically be initiated whenever the status changes or the value is changed beyond a defined band
- High performance central processing units
- Capability to set parameters locally or remotely
- Time synchronization via GPS, NTP or time synchronization supported by some SCADA protocols (such as IEC104).
- Capable to operate satisfactorily in non AC environment within temperature range of -10 to +75 deg C, relative humidity of 5% to 95%.
- The RTU shall be configured using a user friendly configuration tool, that can be installed on a laptop.  
If a license is required, then the contractor shall provide a license for at least 2 laptops  
The connection to the RTU through the tool must be done remotely from the control center or locally from the substation.
- The RTU shall have the ability to be diagnosed through a webserver application, that can be connected remotely from the control center.
- LED indications on the digital input modules to indicate the On-Off status of the digital input data, 1 LED per input point.
- contact bounces and operation time for circuit breakers, isolators and earth switches shall be suppressed
- spikes, power and higher frequency signals shall be suppressed

- the command sequence shall be (selectable) carried out by single-step or two-step procedure with check-back
- the output pulse length shall be selectable 0.1 up to 9 sec
- All process input/output signals shall be protected for over voltage and other disturbances according to IEC 255- 4 or better.
- The RTU shall support cyber-security features according to IEC62351 and IEEE1686.

**d- Sequence of Events Recording:**

Sequence of events (SOE) recording software supported by appropriate hardware shall be provided. The SOE facility shall be able to detect, time stamp and store in the RTU, the status changes in selected input channels and subsequently transmit this information to the control center. The SOE information, along with the details of the involved input channel, shall be stored in chronological order in a sequence of events list, which shall be separate from the normal events list. Events shall be time tagged to a resolution of 1 ms or better within the RTU and to a resolution of better than 20ms system wide. The central system shall periodically synchronize RTU's internal clock with the time subsystem at the control center. Synchronizing of the RTU clocks shall be compensated for the effect of transmission time delays.

**e- Sizing:**

The RTU shall be sufficient to handle a substation consists of 11 Outgoing feeders, each feeder has the following I/O:

- 4 **double point** digital **input** per feeder.
- 5 **single point** digital **input** per feeder.
- 1 **double point** digital **output** per feeder.
- 1 **single point** digital **output** per feeder.
- 6 **single point** digital **input** for whole substation.

The number of the signals transmitted using the main method (from IEDs) shall be unlimited, and can take as much as the IED can send.

The other signals that will be transmitted using the secondary method, shall be as follows including 20% extra spare points:

- 179 DI points
- 40 DO points

The contractor shall supply RTU with sufficient capacity for the number of I/O points mentioned above.

## **6- Testing and Commissioning:**

- **General:**

Factory tests on equipment shall be made according to the applicable IEC Standards, or as specifically specified or according to standards approved by the Employer.

Routine tests shall be made on each unit of all equipment.

The Employer shall be at liberty to demand any additional testing at the manufacturer's works, at site or elsewhere in order to verify that the equipment complies with the conditions of the Specifications. Any such testing should be at the Contractor's expense. A program of all tests in the factory and at Site is to be mutually agreed upon between the Contractor and the Employer.

- **Factory Acceptance Test (RTU):**

Before packing or dispatching, factory acceptance tests shall be carried out on all RTUs.

The features that shall be subject to FAT shall include:

- a- Test on all I/O points (including single and two-bit indications, analogue inputs, digital outputs, analogue outputs, tap position indications, etc.)

- b- Test expansion capability of a minimum equipped RTU by addition of I/O cards up to its full expansion capacity
- c- verification of communications capabilities including single and dual communications configurations
- d- Downloading and parameterization of RTU software

It is not envisaged that the Employer will witness all RTU FATs. However, before the first batch of RTUs is shipped a FAT shall be carried out on a representative number of RTUs, which shall include all types, and configurations of RTUs being proposed under this Contract. The Employer, or his representative, may witness this test (and any others) at his discretion.

- **Type Tests:**

Type tests shall be made on one unit of each type of different equipment. Instead of carrying out the type tests the Contractor may submit suitable certificates of tests made on equipment of the same type; however, the Employer reserves the right of accepting these certificates or to reject them partially or totally.

## 7- Training:

- **General:**

The contractor shall include a proposed training program in his tender. The training shall include classroom type training and on-the-job training.

- **RTU training:**

A training session shall be held by the contractor with at least the following topics:

- a- Intensive training on the configuration tool of the RTU.
- b- On job training on how to configuring the RTU from scratch including all parameters.
- c- Changing the communication parameters of the RTU.
- d- Installing new firmware for the RTU
- e- Handling all the communication ports.
- f- Hardware diagnostics for the RTU and how to replace a module.

## 8- O&M Manuals:

- **General:**

Operation and maintenance manuals provided by Tenderer to the Employer shall describe in detail, the procedure and the operating instructions for the equipment and for measuring devices. The manuals shall contain a comprehensive description of the relevant portion of the Work including all data such as ratings, weights, dimensions etc.

Contractor shall provide three (3) copies of the Operation and Maintenance manuals, stamped "Approved", and one electronic file to the Employer.

- **Content of the Manuals:**

Manuals shall contain assembly methods, a commissioning guide including settings, adjustment, operation and disassembly of every component, system or machine, which shall be described and illustrated in detail. Manuals shall also include a trouble-shooting procedure to locate defective parts rapidly. For preventive maintenance purposes, manuals shall include a list of verification points with visual marking and measurements. For software, manuals shall include descriptions of the software structure, software and

database implementation, operating procedures, user interface description and any other descriptions necessary to use, support and troubleshoot the software.  
Maintenance instructions and recommended frequency for inspection of every component shall be described in the manuals.  
Contractor shall submit manuals that are clear, fully detailed and easily understood, to ensure the appropriate operation and maintenance of the equipment.

## **9- Laptop:**

A laptop shall be included in the offer according to the following specifications:

- 1- 13th generation core I5 or higher
- 2- 8GB RAM or higher
- 3- Windows 11
- 4- 1 TB SSD hard desk or higher
- 5- Long term battery
- 6- Light weight
- 7- Back bag to be included

## **10- Spare Parts:**

The following spare parts shall be provided by the contractor:

No.	Item	Qty
1-	DI module	2
2-	DO module	1
3-	Aux Relays (if applicable in DO circuit)	15
4-	Knife type terminals	50
5-	CPU module	1
6-	Power supply module	1

## Appendix

### Schedule A: Specifications: -

	RTU		
Supply Voltage			
	Supply Voltage Value		
	Permissible variation in voltage level		
General Specification			
	Time synchronization method	GPS/NTP	
	Time synchronization period		
	Communication protocol	IEC 60870-5-104 IEC 60870-5-101 Modbus Serial & TCP/IP DNP3 over TCP/IP IEC 61850	
	Diagnostic LED	Yes	
	Operating Temperature	-10°C-+75°C	
	Real time clock resolution	1 ms	
	Execution cycle time	1 ms	
	Number of serial ports and types	2 RS485	
	Baud rate supported	Min. 2400 bit/s and higher (adjustable)	
	Number of Ethernet Port (other than ports for collecting data from the relays)	2	
	Extended Ethernet Card with 5 Ethernet Ports	5	
	CPU Watchdog	Yes	
	Spikes, power and higher frequency signals shall be suppressed	Yes	

	Output pulse length shall be selectable 0.1 up to 9 sec	Yes	
	Capability to accept a “poll” or “request” message and respond by a “reply” message	Yes	
	Analog values can be reported cyclically or by exception	Yes	
	Supports cyber-security features according to IEC62351 and IEEE1686	Yes	
	RTU Type Test Certificate		
	RTU Test equipment/tool		
	Dimensions		
	IP		
	Manufacturer		
	Origin		
	Modular design and scalable	Yes	
	Special user-friendly tool for RTU configuration, including any required license.	Yes	
	Availability to access the RTU through webpage for diagnosis and monitoring.	Yes	
	Integration with ABB SYS600 SCADA	Yes	
	Long term life cycle and global support	Yes	
<b>DI module</b>			
	Number of input points	179	
	Number of input channels per module		
	Nominal input voltage		
	Max. Input voltage		
	Availability of events time stamping	Yes	
	Time resolution for SOE events	1 ms	
	Galvanic isolation (KV AC for 1 min)	>=1 KV	
	Impulse withstand (KV DC for 50 ms)	>=2 KV	
	Short Circuit Protection	Yes	

	Filter	Yes	
<b>DO module</b>			
	Number of output points	40	
	Number of output channels per module		
	Type of contact		
	Max. switching voltage		
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 2$ KV	
	Output closure time range	0.5ms – 30s	
	Short Circuit Protection	Yes	

## SCHEDULE A

### PROCUREMENT, DESIGN, MANUFACTURE, INSPECTION, TESTING, DELIVERY AND COMPLETION DATES

This schedule shall be completed by the Tenderer to show the time, calculated from the date of award of contract. In which he guarantee to dispatch ex-work of varies sections of the plant and equipment. The time given shall be binding on the contractor except is as far as they may be varied by agreement with the purchaser.

The times quoted for the main items of plant and equipment shall apply equally to all associated and ancillary equipment...etc. necessary to completely deliver the plant ready for shipment.

Target date for completion delivery C&F for all equipment under this contract should be earlier than 26 weeks from the date of the contract award & further 2 weeks for erection testing and commissioning. Otherwise, the offer may be not considered if the delivery time is longer.

## RTU

Note: All time periods are weeks from date of Contract Placement.

DESCRIPTION	DELIVERY PERIOD	COMMENTS
- Time within which The Whole <u>Base Design Package</u> (General Arrangement Drawings, Bill-Of-Quantity, Diagrams, Sample Drawings, etc) shall be submitted for Review & Approval		
- Time within which the Base Design Package should be Reviewed By EDCO Enabling the <u>Release For Manufacturing Certificate issuance</u> .	Two (02) Weeks	From the date of duly Handing-Over to EDCO Office.
- Time within which The Whole <u>Detailed Design Package</u> (all wiring and cable drawings/schedules, feruling list, Inspection & Test Plan – ITP – Catalogs, etc) shall be submitted.		
- Time within which the Detailed Design Package should be Reviewed By EDCO.		Does not Disrupt materials ordering and primary manufacturing.

- Time within which equipment & Material shall be available for final inspection and testing at manufacturer's premises ( <u>Invitation to FAT date</u> ).		Notice for FAT Readiness shall be advised to EDCO's attention, at least Twenty One (21) days prior to FAT date.
-Duration of FAT.	Five working days	Estimated for contractual use only, and might be different in fact.
- Duration of FAT report review by EDCO.	Two (02)Weeks	From the duly date of submitting to EDCO.
-Duration of Freight. Road Freight: Overseas/Ocean :		Estimated for contractual use only.
- Time within which all materials shall be delivered.		As per Incoterms 2000 definitions, & DOR.

## SCHEDULE B

### MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING

Tenderers shall state the town and country where manufacture, testing and inspection are to take place.

Tenderers shall state the town and country where manufacture is.

DESCRIPTION	Manufacturer	Place of Manufacturer
<u>RTU</u>		
<u>Cables and wires</u>		
<u>MCBs</u>		
<u>Terminals</u>		

- All above equipment should be of pioneer manufacturers and subject to EDCO approval.

## **SCHEDULE C**

### **PRICES FOR PLANT AND EQUIPMENT**

#### **General**

The prices below for various items, whether or not the items are fully described, shall include everything necessary to provide the equipment complete and in working order in accordance with the provisions of the contract.

Tenderers and their manner shall fill in the following schedule completely and without omissions, and breakdown may not be changed. However, extra sheets may supplement this schedule if this were necessary.

#### **1. DEFINITE WORK FOR A PRICE BREAK DOWN BASIS**

	Description	Currency .....			
		Qty.	F.O.B Unit	Freight Unit	Total Price C&F Aqaba
<b><i>SECTION2: SCADA Equipment</i></b>					
a-	RTU Panel (including all cards, modules, internal wirings, terminals, MCBs, labeling, and licenses)	1			
b-	RTU configuration software including required license for 2 different laptops	1			
i-	Training on the RTU and DC system				
j-	Laptop	1			

**Price break down should be included in the offer for all elements and devices.**

**SCHEDULE D**  
**QUANTITIES AND PRICES FOR MANDATORY SPARES**

The Tenderer shall complete this schedule. The Tenderer shall furnish a complete list of spares with break-down of prices recommended which may or may not in whole or in part be purchased by the purchaser under the contract.

The costs of these items shall be included in the Summary of Prices (Schedule L) under the Provisional items.

Qty	Description	Currency .....		
		F.O. B Unit	Freight Unit	Total Price C&F Aqaba
2	DI Module.			
1	DO Module.			
15	Aux Relays.			
50	Knife type terminals.			
1	CPU Module.			
1	Power Supply Module.			
TOTAL OF SCHEDULE D				

## SCHEDULE E

### DEPARTURE FROM SPECIFICATION

All deviations should be listed, in case it is not the equipments will be considered complying our specifications, mandatory departures will not be accepted nor paid for.

Item No.	Departure from specification

## **SCHEDULE (F)**

### **List of References in Main Substations**

<b><u>PROJECT</u></b>	<b><u>COUNTRY</u></b>	<b><u>YEAR</u></b>

Similar tested project in (Main Substations) is an advantage

## RMU's Automation

## **Secondary S/S ring main units Automation project**

This project aims to automate 20 RMUs located, in order to increase the reliability of the electrical system.

The following items are required for this project:

- Item-1- Mini RTU.....30pcs
- Item-2- GPRS communication modem.....30pcs
- Item-3- DC system (Rectifier with Batteries Group).....30pcs
- Item-4- Enclosures, to include the above 3 items.....30pcs
- Item-5- Current sensors.....30pcs
- Item-6- Metering device with fault indication feature.....30pcs

Each one of 30 enclosures shall include one miniRTU, one communication modem and one DC system with all necessary wiring, terminations, MCBs and any needed equipment according to the below mentioned technical specifications, so they will be considered as one single unit.

### **Technical Specifications:**

#### **Item - 1 - Mini RTU**

##### **General**

The Mini Remote Terminal Unit (Mini RTU), shall be installed at Ring Main Unit (RMU) & Power stations to collect process information and control the (RMU & Substation) equipment's. The supplied Mini RTUs shall monitor and control the CBs/LBS inside the RMUs and to be interfaced to field devices such as (Transducers, IEDs, Metering Unit...etc.) using different interfaces and communicate to master station via different communication protocols as described in the specification though General Packet Radio Service (GPRS) modem.

##### **Hardware Components**

- CPU & Power Supply

The Mini RTU shall include one CPU which is responsible for the main processing tasks and for the communication. The main tasks of the CPU are managing and controlling associated actions of I/O.

The CPU shall have the following minimum number of communication ports:

1. Two serial ports over for RS-485 communications.
2. Two Ethernet ports for communication with master station and IEDs, which also can be used for configuration purposes.

- Input / Output Units

The Mini RTU shall be equipped with modules (DI & DO) to deal with different data types from field devices.

For commands there should be a 1 out of n check, to ensure that only one command will be activated at a time. All events shall be time stamped with 1ms accuracy.

## **Communication Protocols**

### **1. Master Station Communication Protocols**

The Mini RTU shall be capable of communicating with master station using following tele-control communication protocols

- DNP3.0 serial and Ethernet
- Modbus RTU and TCP
- IEC 61850
- IEC 60870-5-101/104

### **2. Communication Protocol between RTU & IEDs**

The Mini RTU shall also provide serial / Ethernet interfaces for the communication with subordinated devices like intelligent electronic devices (IEDs). Digital protection relays, metering devices..etc. Following protocols are shall be supported at least

- DNP3.0 serial and Ethernet
- Modbus RTU and TCP
- IEC 60870-5-101/104
- IEC 61850

## **Documentation :**

Comprehensive RTU documentation is required such as:

- Data Sheets
- RTU tool User's Guide
- Communication Interfaces (towards Host and Sub- devices)
- Signal lists in EXCEL

## **Cyber Security**

Cyber security features and mechanisms according to attached cyber security requirements. In addition, the following features shall be possible:

- The mini RTU shall have different levels of passwords in order to provide different benefits according to the user type.
- The mini RTU service application shall enforce a high complexity of passwords.
- The mini RTU shall ensure Secured Encrypted communications: SSH, HTTPS, etc.

## **Mini RTU Functions**

As a minimum, the Mini RTUs shall be capable of performing the following functions:

- 1- Data gathering, the mini RTU shall collect digital inputs, and information points from devices relays and/or IEDs.
- 2- The mini RTU shall receive, process, and perform the digital control commands received from the Control Center.
- 3- Mini RTU shall support Sequence of Events feature (SOE)
- 4- The mini RTU shall have internal battery backup for memory and date/time.
- 5- Mini RTU shall be capable to communicate simultaneously on all communication ports.
- 6- The Mini RTU shall support the use of a different communication data exchange rate (bits per second) and scanning cycle on each port.
- 7- Mini RTU shall have the capability of automatic re-start after a power outage without manual intervention.
- 8- Mini RTU modules, shall have light emitting diodes (LEDs) to indicate errors or operating modes

- 9- A special tool (webserver application, special software...etc.) should be used in order to configure the mini RTU, read RMU measurements, indications, events and alarms.
- 10- Any necessary license to operate the RTU or the RTU software shall be proposed separately in the offer (for one laptop), EDCO has the right to decide to not buy it in case it was provided previously.
- 11- The Mini RTU shall provide remote diagnostics capabilities. It shall be possible to connect to the Mini RTU from a remote computer in order to analyze the system and error status, check-up of the configuration or signal values of the RTU remotely, e.g. by means of a Web-Server via LAN/WAN.
- 12- The Mini RTU shall be equipped with Cyber Security Features
- 13- The Mini RTU shall support time synchronized by external GPS equipment or from the control center
- 14- For the measurements that are transmitted over Modbus the RTU shall be able to read all possible data types (32bit (signed unsigned), 16bit (signed, unsigned), float, single bit,...).

### **Item - 2 - Communication Modem:**

The supplier shall include a ROBUSTEL - R3000 Lite communication modem to perform the communications tasks between the mini RTU and the Control Center.

The modem must contain the following accessories:

- Wall Mounting Kit.
- Power supply.
- one antenna (3G).
- one magnet antenna (3G) (3meters).
- 3x1 pin pluggable terminal block for power supply.
- Ethernet cable.

### **Item - 3 - DC charger (rectifier with batteries group):**

The DC charger will be responsible for supplying the mini RTU, communication modem and RMU operating mechanism with DC voltage.

A 48 VDC charger is required to charge batteries group and supply auxiliary equipment, inside the RTU, it shall include a rechargeable Gel, AGM or Lithium-ion type maintenance free batteries, with minimum capacity not less than 18Ah@20h.

The DC charger shall be equipped with set of miniature's circuit breaker for protection purpose as well as it shall be protected against short circuit, earth faults, common fault...etc.

The charger shall accept input voltage of 110-220VAC, with standard output voltage 48VDC at 10A, as well as to include DC/DC converters for other supply purposes.

The DC chargers shall be able to supply the following voltages:

- 110VDC.
- 48VDC.
- 24VDC.

The supplier may include 48/24V and 48/110V DC/DC converters **with output current for each converter not less than 10A**, to supply all 3 required voltages 48VDC, 24VDC and 110VDC.

All required documentations, manuals, drawings and data sheets shall be submitted.

#### **Item - 4 – Enclosures:**

The Enclosures shall include the following items:

- Mini-RTU
- DC System
- GPRS communication modem.

All required internal wiring, termination, MCBs, labeling, etc. shall be performed by the supplier.

- The enclosures shall be outdoor type, weatherproof and dust proof of coated steel, thickness of the steel not less than 1.5 mm, it shall be thermal coating with thickness not less than 40 microns. The internal and external color and finish of the housing shall be approved by our Engineer.
- The IP degree for the Enclosures cubical should be of IP 54
- Set of holes shall be considered for in design for control cables.
- The housing shall be adequately ventilated and yet shall be so designed that birds, lizards and small rodents etc., cannot gain access to the equipment.
- Steel meshes behind louvers should be used for this purpose.

- External doors of the Enclosures shall be equipped with suitable stoppers to keep doors open in a fixed position during Operation and maintenance.
- External doors of the Enclosures shall be equipped with suitable metal hinges to be screwed onto uprights.
- External doors of the Enclosures shall be equipped with suitable pad lockable lever handle.
- A cooling mechanism shall be included with the system to cool the batteries, converters and the charger.
- AC socket outlet shall be included for general purpose Ac supply such as Laptop.

#### **Item - 5 - Current Sensor:**

Current sensors shall be based on Rogowski coil with accuracy class 0.5 for measuring and fault indicator purposes and complies with IEC 61869-10 standards, where the current Sensor should be supplied with a (connector adapter with multi ports) for connection to the measuring device or directly to Mini Remote Terminal Unit (Mini RTU). In addition to that Current sensors should suit retrofit purposes and ready to be installed on site without need to unplug cable connector.

Each current sensor shall be connected to a single phase

#### **Item - 6 - Metering Device & fault passage indicator**

A universal device for Metering and fault indicating function is required to support the following functions:

- Detecting and indicating overcurrent & ground faults passaging.
- Measuring and displaying the following values:
  - Current at each phase.
  - Voltage (Phase to Phase and Phase to Neutral).
  - Power Frequency.
  - Power Factor.
  - Active power (P), Reactive power (Q), Apparent power (S).
  - Energy.
- Supports, Modbus communication protocols.

- Read the voltage input from different sources (Capacitive Voltage Indicators, Voltage sensors, or Voltage transformers), and can be configured according to the available voltage reading source.
- Equipped with the following hardware interfaces:
  - RS 485 port (Modbus RTU)
  - Three current inputs adequate with current sensors.
  - Three voltage inputs with capability of calibration with either existing **CVI units** in RMU's or **voltage sensors** or **voltage transformers** as in the above description.
  - Auxiliary power supply.

### **Item - 7 – Laptop:**

The contractor shall include a laptop in his offer according to the following specs:

- 1- 13th generation core I5 or higher
- 2- 8GB RAM or higher
- 3- Windows 11
- 4- 1 TB SSD hard desk or higher
- 5- Long term battery
- 6- Light weight
- 7- Back bag to be included

### **Environmental Condition**

Climatic conditions according IEC 60870-2-2:

Temperature:                    -25°C...+55°C (Class C2)

Relative Humidity:        5...95%, non condensing  
(Class C1)

Atmospheric pressure    70 to 106 kPa

Altitude (operation)       up to 3000 m

Item	Standard	Test Level
1	Low Temperature (IEC 60068-2-1)	-25°C
2	High Temperature (IEC 60068-2-2)	+70°C
3	Temperature-Humidity (IEC 60068-2-30, cyclic test)	95%
4	Vibration response test, sinusoidal: IEC 60068-2-6 IEC 60255-21-1 Class 1 0,5g (10 – 150 Hz)	0,5g (10 – 150 Hz)

Item	Standard	Test Level
5	Vibration seismic test, sinusoidal: IEC 60068-2-6 IEC 60255-21-3 Class 1: 3,5mm (1 – 9 Hz) IEC 60870-2-2 Class Bm: 3mm (2 – 9 Hz)	3mm (2-9 Hz)
6	Vibration endurance test, sinusoidal: IEC 60068-2-6 IEC 60255-21-1 Class 1: 0,5g (10 – 150 Hz) IEC 60870-2-2 Class Bm: 1g (9 – 200 Hz)	1g (9 – 200 Hz)
7	Vibration high frequency test, sinusoidal: IEC 60068-2-6 IEC 60870-2-2 Class Bm: 1,5g (200 – 500 Hz)	1,5g (200 – 500 Hz)
8	Shock (half sine) IEC 60068-2-27 IEC 60255-21-2 CL1 (15g / 11ms) IEC 60870-2-2 (10g / 11ms)	15g / 11ms and 25g / 10ms
9	Bump (half sine) IEC 60068-2-29 IEC 60870-2-2 Class 1: 10g / 16ms / 1000 pulses	10g / 16ms / 1000 pulses

## Insulation, EMC Immunity and CE Declaration

### Insulation

Item	Standard	Test Level
1	Insulation resistance according IEC 60255-5	>100MOhm / 500V DC
2	Insulation dielectric withstand voltages according IEC 60255-5 (IEC 60870-2-1 class VW3, ANSI/IEEE C37.90-1989, 1,5kV)	2,5kV, 50Hz, 1min
3	Insulation impulse voltage withstand test IEC 60255-5 (IEC 60870-2-1 class VW3)	5kV (1,2/50µs)

### EMC Immunity Tests

Item	Standard	Test Level
1	<b>Electro static discharge immunity</b> IEC 61000-4-2 level 4 (IEC 60870-2-1 A3.1 level 4) (IEC61000-6-2 8/6kV) (IEC 60255-22-2 8/6kV) (ANSI/IEEE C37.90.3-2001, 8kV)	Cubicle: 15/8kV Modules: 8/6kV
2	<b>Radiated electromagnetic field</b> IEC 61000-4-3 (IEC 60870-2-1 A5.1 level 3) (IEC61000-6-2 10V/m) (IEC 60255-22-3 10V/m)	10V/m level 3
3	<b>Electrical Disturbances 1 MHz Burst</b> IEC 60255-22-1 IEC61000-4 IEC61000-18	2.5KV CM, 1.0KV DM
4	<b>Fast Transient Burst Immunity</b> IEC 61000-4-4 (IEC 60870-2-1 A2.3 level 4) (IEC61000-6-2 A/D=2kV, S=1kV) (IEC 60255-22-4 4kV) (ANSI/IEEE C37.90.1-2002, 4kV)	4kV Level 4
5	<b>Surge Immunity</b> IEC 61000-4-5 (IEC 60870-2-1 A2.2 level 3) (IEC61000-6-2 A=1/2kV, S=1kV) (IEC 60255-22-3 2kV)  <b>feeder distributed RTU equipment</b> IEC 61000-4-5 (IEC 60870-2-1 A2.2 level 4)	2kV Class 3      4kV Class 4

	(IEC61000-6-2 A=1/2kV, S=1kV) (IEC 60255-22-3 2kV)	
6	<b>Conducted RF Disturbance Immunity</b> IEC 61000-4-6 (IEC61000-6-2 10V) (IEC 60255-22-6 10V)	10V Level 3
7	<b>Pulse Magnetic Field Immunity</b> IEC 61000-4-9	1000A Level 5
Item	Standard	Test Level
8	<b>Damped Oscillatory Waves</b> IEC 61000-4-12 (IEC 60870-2-1 A2.5 level 3-4) (ANSI/IEEE C37.90.1-2002, 2,5kV)	2,5kV / 1kV Level 3
9	<b>Ring Wave</b> IEC 61000-4-12 (IEC 60870-2-1 A2.4 level 3) (ANSI/IEEE C37.90.1-2002, 2,5kV)	2,5kV Level 4
10	<b>Power Frequency Interference 50Hz</b> IEC 61000-4-16 level 4	30V cont. 300V / 10s
11	<b>AC Ripple on DC Supply</b> IEC 60870-2-1 A1.4 level 2 IEC 61000-4-17 level 3	12%
12	<b>Voltage Dips DC</b> IEC 61000-4-29 (IEC 60870-2-1 A1.5 level 1 30% 0,5s)	-30% for 0,1s -60% for 0,1s
13	<b>Voltage Interruption DC</b> IEC 61000-4-29 (IEC 60870-2-1 A1.5 level 1	-100% for 10ms

#### EMC Emission Tests

Item	Standard	Test Level
1	<b>Enclosure: Radio Interference Field Strength</b> IEC/CISPR 11 / EN50011	30dB (30 – 230MHz) 37dB (230 – 1000MHz)

2	<b>Power Supply: Radio Interference Voltage</b> IEC/CISPR 11 / EN50011	79dB (0,15 – 0,5MHz) 73dB (0,5 – 30MHz)

**SCHEDULE (A)**  
**SCHEDULE OF REQUIREMENTS**

<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity required</b>
1	MiniRTU with all required modules	pcs	30
2	Communication modem as specified	pcs	30
3	DC system, with outputs 110, 48 and 24 VDC not less than 10A for each output.	pcs	30
4	Enclosure as specified	pcs	30
5	Single phase current sensors	pcs	90
6	Universal device for Metering and fault indicator as described.	pcs	30
7	Laptop according to specs (optional)	pcs	1

Notes:

Each Enclosure shall include one miniRTU, one Communication Modem and one DC system

Items 5 and 6 are loose items

Mini RTU			
	Number of RTUs	30	
Supply Voltage			
	Supply Voltage Value		
	Embedded	Yes	
	Permissible variation in voltage level	+/- 10	
General Specification			
	Time synchronization method	NTP/external GPS or through IEC104	
	Time synchronization period	1ms	
	Communication protocol	IEC 60870-5-104 IEC 60870-5-101 Modbus Serial & TCP/IP DNP3 over TCP/IP IEC 61850	
	Diagnostic LED	Yes	
	Operating Temperature	-25°C-+70°C	
	Real time clock resolution	1 ms	
	Execution cycle time	1 ms	
	Number of serial ports	2	
	Baud rate supported	Min. 9600 bit/s (adjustable) or above	
	Number of Ethernet Port	2	
	CPU Watchdog	Yes	
	Availability of events time stamping	Yes	
	Time resolution for SOE events	1 ms	
	Supports cyber-security features according to IEC62351 and IEEE1686	Yes	
	Dimensions		
	IP	65	
	Manufacturer		

	Origin		
<b>DI module</b>			
	Minimum Number of input points for each mini RTU	32	
	Nominal input voltage		
	Max. Input voltage		
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 5$ KV	
	Short Circuit Protection	Yes	
	Filter	Yes	
<b>DO module</b>			
	Number of output points for each RTU	8	
	Type of contact		
	Max. switching voltage		
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 5$ KV	
	Output closure time range	0.5ms – 30s	
	Short Circuit Protection	Yes	
	Filter	Yes	

<b>Communication Modem</b>			
	Brand	ROBUSTEL - R3000 Lite	
	Quantity	30	
	Operating temperature	-40- +75C°	

DC System			
DC Charger			
	DC system, with outputs 110, 48 and 24 VDC not less than 10A for each output.	30	
	Manufacturer		
	Country of origin		
	Rated input voltage	110-240VAC	
	Rated output voltage	48VDC, 24VDC and 110VDC	
	Rated output current on each output voltage levels for both types. <i>For example what is the rated current that the 24VDC can supply.</i>	24VDC: 10A 48VDC: 10A 110VDC: 10A	
	Standard		
	Description / Catalogue	Shall be included	
Batteries Group			
	Manufacturer		
	Country of origin		
	Type (Gel, AGM or Lithium Ion)		
	Number of cells	6	
	Rated voltage/Battery	12	
	Rated capacity 20h	18Ah	
	capacity 8h		
	Number of batteries	4	
	Float charging voltage		
	Standard		
	Description / Catalogue		

Enclosure			
	Qty	30	
	IP Degree of the enclosure	IP54	

Current Sensors			
	Qty	90	
	Manufacturer and type		
	Primary/secondary ratio		
	Standard accuracy classification: 0.5a. for metering service		
	Operating Frequency :50 Hz		

Metering Device and Fault indicator			
	Brand		
	Country of origin		
	Quantity	30	
	Supports Modbus over serial	yes	
	Includes serial port RS485	yes	
	Supply Voltage		
	Number of current inputs	3	
	Number of voltage inputs	4 (3-Phases and 1 neutral)	
	Can Read the voltage input from different sources (Capacitive Voltage Indicators, Voltage sensors, or Voltage transformers)	yes	
	Ability to measure the following measurements at least: - Currents (Ia, Ib, Ic and In). - Voltages (Phase to Phase and Phase to Neutral). - Power Frequency. - Power Factor. - Active power (P), Reactive power (Q), Apparent power (S). - Energy.	yes	
	Supports fault detection	yes	



**SCHEDULE (B)**  
**PRICE SCHEDULE**

ITEM NO.	DESCRIPTION	UNIT	QUANTITY REQUIRED	UNIT PRICE & CURRENCY		TOTAL.PRICE C&F AQABA- JORDAN
				FOB	C&F AQABA	
1	MiniRTU with all required modules	pcs	30			
2	Communication modem as specified	pcs	30			
	DC system, with outputs 110, 48 and 24 VDC not less than 10A for each output.	pcs	30			
4	Enclosure as specified	pcs	30			
5	Single phase current sensors	pcs	90			
6	Universal device for Metering and fault indicator as described.	pcs	30			
7	Laptop according to specs (optional)	Pcs	1			
	<b>Total Price C&amp;F Aqaba</b>					

**SCHEDULE (C)**  
**GUARANTEED DELIVERY PERIODS IN WEEKS**

This Schedule shall be completed by the Tenderer and the periods entered shall be binding on the Contractor

ITEM NO.	DESCRIPTION	DELIVERY PERIOD FOB PORT OF LOADING-SPECIFY PORT	DELIVERY PERIOD TO AQABA PORT-JORDAN
1	MiniRTU with all required modules		
2	Communication modem as specified		
3	DC system, with outputs 110, 48 and 24 VDC not less than 10A for each output.		
4	Enclosure as specified		
5	Single phase current sensors		
6	Universal device for Metering and fault indicator as described.		
7	Laptop according to specs (optional)		

**SCHEDULE (D)**  
**MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING**

The Tenderer shall state the town and country where manufacture, testing and inspection take place.

ITEM NO.	DESCRIPTION	MANUFACTURER	PLACE OF MANUFACTURE	PLACE OF TESTING AND INSPECTION
1	MiniRTU with all required modules			
2	Communication modem as specified			
3	DC system, with outputs 110, 48 and 24 VDC not less than 10A for each output.			
4	Enclosure as specified			
5	Single phase current sensors			
6	Universal device for Metering and fault indicator as described.			
7	Laptop according to specs (optional)			

**SCHEDULE (D)**  
**Deviation from specifications**

ITEM NO.	DESCRIPTION	DEVIATION

**SCHEDULE (G)**  
**SERVICE EXPERIENCE FOR OFFERED MATERIALS**

Tenderers shall provide the information required below for the service experience of the same offered materials.

CUSTOMER	DESCRIPTION	TOTAL QTY	NO. OF YEARS IN SERVICE

## LV Renewable Energy Projects Automation

## **General**

This document is to describe the technical specifications of the equipment that will be installed to control and monitor the renewable energy projects that are installed on the low voltage side of the grid. These equipment are (Mini RTU, GPRS modem and an enclosure).

The Mini RTU will be responsible to:

- Monitor and control the MCCB that interface the project to the grid.
- Monitor and control the Inverter installed in the project.
- Read all the available measurements values.

All the above process data will be transmitted to the control center located in EDCO's HQ Amman.

The supplied Mini RTUs shall be interfaced to field devices such as (Transducers, IEDs, Metering Units...etc.) using different interfaces and communicate to master station via different protocols as described in the specification though General Packet Radio Service (GPRS) modem.

Both Mini RTU and GPRS modem shall be installed in the enclosure, and all required internal wiring, termination, MCBs, labeling, etc. shall be performed by the supplier.

The supplier shall provide a closed system (enclosure includes mini RTU and GPRS modem) to be installed in the site.

## **Mini RTU**

### **Hardware Components**

- CPU:

The Mini RTU shall include one CPU which is responsible for the main processing tasks and for the communication. The main tasks of the CPU are managing and controlling associated actions of I/O.

The CPU shall have the following minimum number of communication ports:

1. Two serial ports each one can communicate through RS-485 communications.
2. Two Ethernet ports for communication with master station and IEDs, which also can be used for configuration purposes.

- **Power Supply:**

The mini RTU shall be operated from the available voltage in the project where it is preferable to supply a mini RTUs that operate directly from 220VAC, however if this type of mini RTU is not available, then it is OK to supply an AC/DC converter from 220VAC to the available operating voltage of the mini RTU.

- **Input / Output Units:**

The Mini RTU shall be equipped with modules (DI & DO) to deals with different data types from field devices.

Regarding the required voltage for the DI modules, the same policy for choosing the operating voltage mentioned above, shall be applied. If the converter solution is chosen, then it shall be connected to the common wire, that feeds all the signals.

For commands there should be a 1 out of n check, to ensure that only one command will be activated at a time. All events shall be time stamped with 1ms accuracy.

### **Mini RTU Sizing**

The minimum number of DI points and DO points required, is as below, after including 20% extra points as spares:

DI points: 8.

DO points: 3.

### **Communication Protocols**

- **Master Station Communication Protocols**

The Mini RTU shall be capable to communicate with master station using following tele-control communication protocols

1. DNP3.0 serial and Ethernet
2. Modbus RTU and TCP
3. IEC 61850
4. IEC 60870-5-101/104

- Communication Protocol between RTU & IEDs

The Mini RTU shall also provide serial / Ethernet interfaces for the communication with subordinated devices like intelligent electronic devices (IEDs). Digital protection relays, metering devices...etc. Following protocols are shall be supported at least

1. DNP3.0 serial and Ethernet
2. Modbus RTU and TCP
3. IEC 60870-5-101/104
4. IEC 61850

### **Documentation:**

Comprehensive RTU documentation is required such as:

- Data Sheets for all the components of the RTU
- RTU tool User's Guide
- Communication Interfaces (towards Host and Sub- devices)
- Signal lists in EXCEL

### **Training:**

The supplier shall offer a training for at least 3 EDCO engineers on the RTU, RTU software tools, examples to clarify all the cases shall be demonstrated and explained. The training can be done online using MS-teams meeting in the site.

### **Cyber Security**

Cyber security features and mechanisms according to IEC62351 and IEEE1686. In addition, the following features shall be possible:

- The mini RTU shall have different levels of passwords in order to provide different benefits according to the user type.
- The mini RTU service application shall enforce a high complexity of passwords.
- The mini RTU shall ensure Secured Encrypted communications: SSH, HTTPS, etc.

## **Mini RTU Functions**

As a minimum, the Mini RTUs shall be capable of performing the following functions:

- Data gathering, the mini RTU shall collect digital inputs, and information points from devices relays and/or IEDs.
- The mini RTU shall receive, process, and perform the digital control commands received from the Control Center.
- Mini RTU shall support Sequence of Events feature (SOE)
- The mini RTU shall have internal battery backup for memory and date/time.
- Mini RTU shall be capable to communicate simultaneously on all communication ports.
- The Mini RTU shall support the use of a different communication data exchange rate (bits per second) and scanning cycle on each port.
- Mini RTU shall have the capability of automatic re-start after a power outage without manual intervention.
- Mini RTU modules, shall have light emitting diodes (LEDs) to indicate errors or operating modes
- A special tool (webserver application, special software...etc.) should be used in order to configure the mini RTU, read RMU measurements, indications, events and alarms.
- Any necessary license to operate the RTU or the RTU software shall be proposed separately in the offer (for one laptop), EDCO has the right to decide to not buy it in case it was provided previously.
- The Mini RTU shall provide remote diagnostics capabilities. It shall be possible to connect to the Mini RTU from a remote computer in order to analyze the system and error status, check-up of the configuration or signal values of the RTU remotely, e.g. by means of a Web-Server via LAN/WAN.
- The Mini RTU shall be equipped with Cyber Security Features
- The Mini RTU shall support time synchronized by external GPS equipment or from the control center
- For the measurements that are transmitted over Modbus the RTU shall be able to read all possible data types (32bit (signed unsigned), 16bit (signed, unsigned), float, single bit,...).

### **Communication Modem:**

The supplier shall include a ROBUSTEL - R3000 Lite L4L communication modem to perform the communications tasks between the mini RTU and the Control Center.

The modem must contain the following accessories:

- Wall Mounting Kit.
- Power supply.
- one antenna (3G/4G).
- one magnet antenna (3G/4G) (3meters).
- 3x1 pin pluggable terminal block for power supply.
- Ethernet cable.
- A suitable socket outlet shall be included in the enclosure, to be able to supply the modem with the needed 220VAC.

### **Transducer / Multimeter:**

A universal metering device is required to be installed to read the available measurements.

It must support the following functions:

- Measure the following values:
  - Current in each phase and in the neutral.
  - Voltage (Phase to Phase and Phase to Neutral).
  - Power Frequency.
  - Power Factor.
  - Active power (P), Reactive power (Q), Apparent power (S).
  - Energy.
- Supports Modbus over serial communication protocol.
- Equipped with the following hardware interfaces:
  - RS 485 port (Modbus RTU).
  - Three current inputs which will be connected to the secondary side of the existing CT.
  - Four voltage inputs 3 phases and neutral.
  - Auxiliary power supply 220VAC.

## **Enclosures**

The following shall be assembled and installed inside the enclosure:

- Mini-RTU
- GPRS communication modem.

All required internal wiring, termination, MCBs, labeling, etc. shall be performed by the supplier.

- The enclosures shall be outdoor type, weatherproof and dust proof of coated steel, thickness of the steel not less than 1.5 mm, it shall be thermal coating with thickness not less than 40 microns. The internal and external color and finish of the housing shall be approved by our Engineer.
- The IP degree for the Enclosures cubical should be of IP 54
- Set of holes shall be considered for in design for control cables with any required glands.
- The housing shall be adequately ventilated and yet shall be so designed that birds, lizards and small rodents etc., cannot gain access to the equipment.
- Steel meshes behind louvers should be used for this purpose.
- External doors of the Enclosures shall be equipped with suitable stoppers to keep doors open in a fixed position during Operation and maintenance.
- External doors of the Enclosures shall be equipped with suitable metal hinges to be screwed onto uprights.
- External doors of the Enclosures shall be equipped with suitable pad lockable lever handle.
- A cooling mechanism shall be included with the system to cool the internal equipment, where two fans shall be included one to force the air in, and one to force it out.
- AC socket outlet shall be included to supply the modem, it shall comply with the adapter type that comes with the modem.

## **Factory Acceptance Test (RTU):**

Before packing or dispatching, factory acceptance tests shall be carried out on all RTUs.

The features that shall be subject to FAT shall include:

- a- Test on all I/O points (including single and two-bit indications, analogue inputs, digital outputs, analogue outputs, tap position indications, etc.)
- b- Test expansion capability of a minimum equipped RTU by addition of I/O cards up to its full expansion capacity
- c- verification of communications capabilities including single and dual communications configurations
- d- Downloading and parameterization of RTU software

It is not envisaged that the Employer will witness all RTU FATs. However, before the shipping of the RTU, FAT shall be carried out, which shall include all types, and configurations of RTUs being proposed. The Employer, or his representative, may witness this test (and any others) at his discretion.

### **Type Tests:**

Type tests shall be made on one unit of each type of different equipment. Instead of carrying out the type tests the Contractor may submit suitable certificates of tests made on equipment of the same type; however, the Employer reserves the right of accepting these certificates or to reject them partially or totally.

### **Environmental Condition**

Climatic conditions according IEC 60870-2-2:

Temperature: -25°C...+55°C (Class C2)

Relative Humidity: 5...95%, non condensing (Class C1)

Atmospheric pressure 70 to 106 kPa

Altitude (operation) up to 3000 m

Item	Standard	Test Level
1	Low Temperature (IEC 60068-2-1)	-25°C
2	High Temperature (IEC 60068-2-2)	+70°C
3	Temperature-Humidity (IEC 60068-2-30, cyclic test)	95%

4	Vibration response test, sinusoidal: IEC 60068-2-6 IEC 60255-21-1 Class 1 0,5g (10 – 150 Hz)	0,5g (10 – 150 Hz)
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Item	Standard	Test Level
5	Vibration seismic test, sinusoidal: IEC 60068-2-6 IEC 60255-21-3 Class 1: 3,5mm (1 – 9 Hz) IEC 60870-2-2 Class Bm: 3mm (2 – 9 Hz)	3mm (2-9 Hz)
6	Vibration endurance test, sinusoidal: IEC 60068-2-6 IEC 60255-21-1 Class 1: 0,5g (10 – 150 Hz) IEC 60870-2-2 Class Bm: 1g (9 – 200 Hz)	1g (9 – 200 Hz)
7	Vibration high frequency test, sinusoidal: IEC 60068-2-6 IEC 60870-2-2 Class Bm: 1,5g (200 – 500 Hz)	1,5g (200 – 500 Hz)
8	Shock (half sine) IEC 60068-2-27 IEC 60255-21-2 CL1 (15g / 11ms) IEC 60870-2-2 (10g / 11ms)	15g / 11ms and 25g / 10ms
9	Bump (half sine) IEC 60068-2-29 IEC 60870-2-2 Class 1: 10g / 16ms / 1000 pulses	10g / 16ms / 1000 pulses

## Insulation, EMC Immunity and CE Declaration

### Insulation

Item	Standard	Test Level
1	Insulation resistance according IEC 60255-5	>100MOhm / 500V DC

2	Insulation dielectric withstand voltages according IEC 60255-5 (IEC 60870-2-1 class VW3, ANSI/IEEE C37.90-1989, 1,5kV)	2,5kV, 50Hz, 1min
3	Insulation impulse voltage withstand test IEC 60255-5 (IEC 60870-2-1 class VW3)	5kV (1,2/50µs)

### EMC Immunity Tests

Item	Standard	Test Level
1	<b>Electro static discharge immunity</b> IEC 61000-4-2 level 4 (IEC 60870-2-1 A3.1 level 4) (IEC61000-6-2 8/6kV) (IEC 60255-22-2 8/6kV) (ANSI/IEEE C37.90.3-2001, 8kV)	Cubicle: 15/8kV Modules: 8/6kV
2	<b>Radiated electromagnetic field</b> IEC 61000-4-3 (IEC 60870-2-1 A5.1 level 3) (IEC61000-6-2 10V/m) (IEC 60255-22-3 10V/m)	10V/m level 3
3	<b>Electrical Disturbances 1 MHz Burst</b> IEC 60255-22-1 IEC61000-4 IEC61000-18	2.5KV CM, 1.0KV DM
4	<b>Fast Transient Burst Immunity</b> IEC 61000-4-4 (IEC 60870-2-1 A2.3 level 4) (IEC61000-6-2 A/D=2kV, S=1kV) (IEC 60255-22-4 4kV) (ANSI/IEEE C37.90.1-2002, 4kV)	4kV Level 4
5	<b>Surge Immunity</b> IEC 61000-4-5 (IEC 60870-2-1 A2.2 level 3) (IEC61000-6-2 A=1/2kV, S=1kV) (IEC 60255-22-3 2kV)  <b>feeder distributed RTU equipment</b> IEC 61000-4-5 (IEC 60870-2-1 A2.2 level 4) (IEC61000-6-2 A=1/2kV, S=1kV)	2kV Class 3       4kV Class 4

	(IEC 60255-22-3 2kV)	
6	<b>Conducted RF Disturbance Immunity</b> IEC 61000-4-6 (IEC61000-6-2 10V) (IEC 60255-22-6 10V)	10V Level 3
7	<b>Pulse Magnetic Field Immunity</b> IEC 61000-4-9	1000A Level 5
Item	Standard	Test Level
8	<b>Damped Oscillatory Waves</b> IEC 61000-4-12 (IEC 60870-2-1 A2.5 level 3-4) (ANSI/IEEE C37.90.1-2002, 2,5kV)	2,5kV / 1kV Level 3
9	<b>Ring Wave</b> IEC 61000-4-12 (IEC 60870-2-1 A2.4 level 3) (ANSI/IEEE C37.90.1-2002, 2,5kV)	2,5kV Level 4
10	<b>Power Frequency Interference 50Hz</b> IEC 61000-4-16 level 4	30V cont. 300V / 10s
11	<b>AC Ripple on DC Supply</b> IEC 60870-2-1 A1.4 level 2 IEC 61000-4-17 level 3	12%
12	<b>Voltage Dips DC</b> IEC 61000-4-29 (IEC 60870-2-1 A1.5 level 1 30% 0,5s)	-30% for 0,1s -60% for 0,1s
13	<b>Voltage Interruption DC</b> IEC 61000-4-29 (IEC 60870-2-1 A1.5 level 1	-100% for 10ms

### EMC Emission Tests

Item	Standard	Test Level
1	<b>Enclosure: Radio Interference Field Strength</b> IEC/CISPR 11 / EN50011	30dB (30 – 230MHz) 37dB (230 – 1000MHz)

2	<b>Power Supply: Radio Interference Voltage</b> IEC/CISPR 11 / EN50011	79dB (0,15 – 0,5MHz) 73dB (0,5 – 30MHz)

## Appendix

### Schedule A: Specifications: -

	Mini RTU		
	Number of RTUs	10	
Supply Voltage			
	Supply Voltage Value.  state if converter is used to provide suitable voltage	available is 220VAC	
	Permissible variation in voltage level	+/- 10	
General Specification			
	Time synchronization method	NTP/external GPS or through IEC104	
	Time synchronization period	1ms	
	Communication protocol	IEC 60870-5-104 IEC 60870-5-101 Modbus Serial & TCP/IP DNP3 over TCP/IP IEC 61850	
	Diagnostic LED	Yes	
	Operating Temperature	-25°C-+70°C	
	Real time clock resolution	1 ms	

	Execution cycle time	1 ms	
	Number of serial ports	2	
	Baud rate supported	Min. 9600 bit/s (adjustable) or above	
	Number of Ethernet Port	2	
	CPU Watchdog	Yes	
	Availability of events time stamping	Yes	
	Supports cyber-security features according to IEC62351 and IEEE1686	Yes	
	Time resolution for SOE events	1 ms	
	Dimensions		
	IP		
	Manufacturer		
	Origin		
<b>DI module</b>			
	Minimum Number of input points for each mini RTU	8 points	
	Nominal input voltage.  <i>state if converter is used to provide suitable voltage</i>	<i>available is 220VAC</i>	
	Max. Input voltage		
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 5$ KV	
	Short Circuit Protection	Yes	

	Filter	Yes	
<b>DO module</b>			
	Minimum number of output points for each RTU	3 points	
	Type of contact		
	Max. switching voltage		
	Galvanic isolation (KV AC for 1 min)	$\geq 1$ KV	
	Impulse withstand (KV DC for 50 ms)	$\geq 5$ KV	
	Output closure time range	0.5ms – 30s	
	Short Circuit Protection	Yes	
	Filter	Yes	
<b>Communication Modem</b>			
	Brand	ROBUSTEL - R3000 Lite (L4L)	
	Quantity	10	
	Operating temperature	-40- +75C°	
<b>Transducer / Multimeter</b>			
	Brand		
	Country of origin		
	Quantity	<b>10</b>	
	Supports Modbus over serial	yes	
	Includes serial port RS485	yes	
	Supply Voltage	220VAC	
	Number of current inputs	3	
	Number of voltage inputs	4 (3-Phases and 1 neutral)	

	<p>Ability to measure the following measurements at least:</p> <ul style="list-style-type: none"> <li>- Currents (Ia, Ib, Ic and In).</li> <li>- Voltages (Phase to Phase and Phase to Neutral).</li> <li>- Power Frequency.</li> <li>- Power Factor.</li> <li>- Active power (P), Reactive power (Q), Apparent power (S).</li> <li>- Energy.</li> </ul>		
<b>Enclosure</b>			
	IP	54	
	Quantity	10	
	Includes the mini RTU and GPRS modem with all necessary wiring, terminations, MCBs, sockets, fans, cable openings and glands... ready to be installed as a closed system.	yes	

## SCHEDULE A

### List of References

Tenderers shall provide the information required below for the service experience of the RTU offered.

Customer	No. of units supply	No. of years in service	No. of recorded faults

## SCHEDULE B

### PROCUREMENT, DESIGN, MANUFACTURE, INSPECTION, TESTING, DELIVERY AND COMPLETION DATES

This schedule shall be completed by the Tenderer to show the time, calculated from the date of award of contract. In which he guarantee to dispatch ex-work of varies sections of the plant and equipment. The time given shall be binding on the contractor except is as far as they may be varied by agreement with the purchaser.

The times quoted for the main items and equipment shall apply equally to all associated and ancillary equipment...etc. necessary to completely deliver the plant ready for shipment.

Target date for completion delivery C&F for all plant of the switchgear under this contract should be earlier than 18 weeks from the date of the contract award & further 2 weeks for erection testing and commissioning. Otherwise, the offer may be not considered if the delivery time is longer.

## SCHEDULE B (Continued)

### PROCUREMENT, DESIGN, MANUFACTURE, INSPECTION, TESTING, DELIVERY AND COMPLETION DATES

Note: All time periods are weeks from date of Contract Placement.

DESCRIPTION	DELIVERY PERIOD	COMMENTS
- Time within which The Whole <u>Base Design Package</u> (General Arrangement Drawings, Bill-Of-Quantity, Diagrams, Sample Drawings, etc) shall be submitted for Review & Approval		
- Time within which the Base Design Package should be Reviewed By EDCO Enabling the <u>Release For Manufacturing Certificate</u> issuance.	Two (02) Weeks	From the date of duly Handing-Over to EDCO Office.
- Time within which The Whole <u>Detailed Design Package</u> (all wiring and cable drawings/schedules, feruling list, Inspection & Test Plan – ITP – Catalogs, etc) shall be submitted.		
- Time within which the Detailed Design Package should be Reviewed By EDCO.		Does not Disrupt materials ordering and primary manufacturing.

- Time within which equipment & Material shall be available for final inspection and testing at manufacturer's premises ( <u>Invitation to FAT date</u> ).		Notice for FAT Readiness shall be advised to EDCO's attention, at least Twenty One (21) days prior to FAT date.
- Time within which all materials shall be delivered (C&F) AQABA or equivalent.		As per Incoterms 2000 definitions, & DOR.
-Total time required for complete work.		Considering/Including EDCO's Review Time
- Duration of FAT report review by EDCO.	Two (02)Weeks	From the duly date of submitting to EDCO.
-Duration of Freight. Road Freight: Overseas/Ocean :		Estimated for contractual use only.

## SCHEDULE C

### MANUFACTURERS, PLACES OF MANUFACTURE

Tenderers shall state the town and country where manufacture is.

DESCRIPTION	Manufacturer	Place of Manufacturer
RTU		
GPRS Communication Modem		
Transducer / Multimeter		
Enclosure		
MCB (inside enclosure)		
Terminal Blocks		
Voltage Converters (DC/DC) or (AD/DC) (if applicable)		
AC Socket		
Cooling Fan		
Thermostat		

- All above equipment should be of pioneer manufacturers and subject to EDCO approval.

**SCHEDULE D**  
**PRICES FOR MATERIAL AND EQUIPMENT**

**General**

The prices below for various items, whether or not the items are fully described, shall include everything necessary to provide the equipment complete and in working order in accordance with the provisions of the contract.

Tenderers and their manner shall fill in the following schedule completely and without omissions, and breakdown may not be changed. However, extra sheets may supplement this schedule if this were necessary.

1. **DEFINITE WORK FOR A PRICE BREAK DOWN BASIS**

Description	Currency .....			
	Qty.	F.O.B Unit	Freight Unit	Total Price C&F Aqaba
RTU	4			
GPRS Communication Modem	4			
Transducer / Multimeter	2			
Enclosure including all accessories	4			
FAT for two EDCO engineers (Optional)	-			
Training For 3 EDCO Engineers (Optional)	-			
<b>Total</b>				

**Mandatory**

1. **Price break down should be furnished for all elements and devices otherwise the offer will be rejected.**

2. **RTU :**

**Reference list for the past five (5) years of the same offered type, delivered to well-known customers outside the manufacturer country, delivered to five different customers at least.**

**Well-known brand (OR) End user performance certificates of the past five (5) years shall be submitted for a two different customers at least.**

## SCHEDULE E

### DEPARTURE FROM SPECIFICATION

All deviations should be listed, in case it is not the equipment will be considered complying our specifications, mandatory departures will not be accepted nor paid for.

Item No.	Departure from specification