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**توريد وتركيب وتشغيل وصيانة وضمان أجهزة  
عدم إنقطاع للتيار (UPS) بوزارة الإعلام**

## **CONTENTS:**

### **1. INTRODUCTION.**

### **2. GENERAL CONDITIONS.**

### **3. SCOPE of WORKS.**

### **4. TECHNICAL SPECIFICATION FOR SOLID STATE UNINTERRUPTIBLE POWER SUPPLY (UPS).**

#### **PART 1 - GUIDE SPECIFICATION**

- 1.01 Summary.
- 1.02 UPS System Description.
- 1.03 Reference.
- 1.04 Submittals.
- 1.05 Qualification.
- 1.06 Environmental Requirements.
- 1.07 Safety.

#### **PART 2 – PRODUCTS**

- 2.01 Manufacturers.
- 2.02 UPS Module Standard Features.
- 2.03 UPS Module Integrated Accessories.
- 2.04 UPS Rating.
- 2.05 Mechanical Design.
- 2.06 Controls and Indicators.
- 2.07 Communications.
- 2.08 UPS Module Protection.

#### **PART 3 – EXECUTION**

- 3.01 Installation.
- 3.02 Commissioning.
- 3.03 Warranty.

### **5. TECHNICAL SPECIFICATION FOR STATIC TRANSFER SWITCH (STS).**

### **6. BILL OF QUANTITIES (BOQ).**

### **7. SITE VISIT STATEMENT.**

## **1. INTRODUCTION:**

Ministry of Information invites specialized companies to submit their offers for supply to replace, install, test, commission, handing over in perfect working condition and warranty 3 Nos Parallel Redundant 2x120 KVA Uninterruptible Power Supply units (UPS) and 250A Static Transfer Switch (STS) with all associated works, switch boards, cables, cable trays, guarantee and maintenance of all the installed system and equipment for two years, as described in the detailed specification.

## **2. GENERAL CONDITIONS:**

### **2.1 Site Visit**

All tenderers wishing to participate in this tender must visit the site to have a full idea about all the works involved before submitting their offers, as no variation claims shall be entertained. The attached site visit statement with tender documents shall be filled and stamped by the tenderer seal and signed by the tenderer representative and MOI engineer, failing to comply with this, the tenderer's offer shall not be entertained.

2.2 Specifications described hereunder are in brief. Therefore, the tenderer must take into consideration all the equipment, materials, labor, etc. needed for the complete installation to ensure best workmanship and operating conditions, whether detailed in the specifications hereunder or not. Later on "No variation" will be entertained by MOI, and cost will be borne by the contractor.

2.3 All Tenderer wishing to participate in this tender should be attached with offers original catalogues (Technical & User Manual) giving full details for UPS and STS as required in tender specifications, failing to comply with foregoing does mean cancellation of the offer.

2.4 Tenderer should be submit Clause by clause compliance statement for the specification with his offer, failing to comply with foregoing does mean cancellation of the offer.

2.5 The contractor shall take all necessary precautions to replacement without power interruption about existing loads, the works shall include providing all temporary equipments and all materials required.

2.6 Before the UPSs replacement process, the contractor must inspect and load test the existing backup UPS devices on the sites to ensure their safe operation during the replacement.

2.7 In case of failure of the backup equipment test, the contractor shall carried out the maintenance costs, including the costs of replacing the batteries if needed.

2.8 The contractor shall take all necessary precautions not to damage any existing services and should fix any damage done by him during the installation of equipment, at no extra charge.

2.9 All electrical works shall conform to the regulations governing electrical installation works issued by MEW and latest addendum.

2.10 Approval of design, material, equipment, systems, layout, etc., does not relieve the contractor from his contractual obligations if later on found that they do not comply with the specification requirements.

2.11 The contractor should adhere to the equipment offered in his tender documents. The contractor is not allowed to change the equipment offered and should make sure during tender stage that the equipment offered can be obtained within the period of the tender. MOI will not entertain any claims at a later stage.

**2.12 UPS Manufacturer qualifications:** Manufacturer shall be a firm engaged in the manufacture of solid state UPS of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 30 years.

- a. The manufacturer shall be ISO 9001 certified and shall be designed to internationally accepted standards.
- b. Manufacture should have local office and after sales support locally to provide the required support to the project.

2.13 All UPS works should be done by manufacturer local supplier, the local supplier should be have minimum of 20 years as a local supplier for manufacturer.

2.14 The equipment offered by the contractor should be standard range of the manufacturer. The ministry reserves the right to choose any standard and optional feature of the UPS offered.

2.15 The contractor should prepare the necessary working drawings (electrical, and electronic.....etc.) and submit them to MOI engineers for approval within two weeks from the date of signing the contract. No installation works shall be permitted to commence, before approval of the working drawings.

2.16 The contractor should submit a detailed time program chart for the works to the engineer for approval within one week of signing the contract.

2.17 All materials should be best of their kind. Submittal of materials must be submitted for approval within 2 weeks of signing the contract.

2.18 The contractor must ensure that a qualified engineer of the respective field supervises all the works. The engineer must be available at site during the ministry working hours. A list of the contractor's supervisory staff must be submitted to MOI for approval within one week of signing the contract.

2.19 Specifications, and BOQ complete each other. The contractor should consider as one document. A clause by clause statement confirmation shall be submitted along with the offer and it is a must.

2.20 The contractor must ensure cleanliness and safety of the site through out the whole period of execution of the project. No scrap or waste materials should be allowed to accumulate on site; removal of such materials should be carried out on short intervals to avoid mishap, accidents or inconvenience to the site users. If the contractor fails to clear the site off such waste and debris within 48 hours after being notified, the ministry

reserves the rights to carry out the necessary cleaning works and charge the contractor without accepting any claims.

2.21 The successful tenderer shall supply before commissioning two original and Four copies of the following manual for each equipment provided under the Contractor.

- User manuals
- Operational manuals
- Instruction manual
- Services manuals
- Workshop manuals
- Maintenance manuals
- Engineering manuals
- Component layouts
- Printed cards detailed drawings

The delivery of those manuals and all documents necessary for the proper operation and maintenance shall be a pre requisite before issuing the project acceptance certificate. All documents covered above shall be in English.

2.22 Upon completion of all works involved the following drawings:

1. 3 Copies of the complete works shall be submitted A1 size.
2. Three (3) "As- Built" drawings AutoCAD make with DVD disc.

2.23 All the tests should be done without any repair or adjustment to the satisfaction of MOI engineer, any failure in the system during durability test does require another sequence of tests.

**2.22 Completion Period:**

The successful tenderer shall supply, install, test, commission, and hand over in perfect condition all works involved in this tender in a maximum period of **Two months**, from the date of signing the contract.

**2.23 Guarantee & Maintenance:**

The contractor shall be responsible for guarantee and maintenance of all the installed system and equipment for **two years** from the date of issuing the final acceptance certificate. The contractor shall be responsible for supplying all the spare parts needed during the maintenance period.

2.23.1 The contractor should provide preventive maintenance and 24 hours, 7 days a week on-call service for all installed system and equipment for a period of 2 years from the date of issuing the final acceptance certificate.

2.23.2 Preventive maintenance schedules should be submitted to MOI engineer for approval.

2.23.3 During the guarantee period, all materials including running spares shall be carried out by the contractor.

2.23.4 If, during the guarantee and maintenance period, the contractor fails to respond to

any necessary repair calls by MOI within 24 hours after being notified by fax, the ministry reserves the right to execute the repairs under full responsibility from the contractor and charge the contractor the cost of the repairs without accepting any claims from the contractor's side.

#### **2.24 Spare Parts:**

All participating tenderers should submit, with their offer, a written guarantee for the supply of spare parts (when requested by MOI) of all equipment offered for a period of ten years.

#### **2.25 Training:**

The contractor must Train 5 Nos. of MOI technicians and shall take place after commissioning and before issuing the final handing over certificate, the training shall be comprehensive, regarding, theoretical and practical aspects of the offered systems.

### **3. SCOPE OF WORK:**

The work shall involve but shall not be limited to the following items, as the successful tenderer shall do all the necessary works to complete the job even if it is not mentioned in the specification or BOQ.

3.1 Disconnect, dismantle and transfer to ministry store, all UPS and STS which will be replaced with related services.

3.2 Supply, installation, testing, commissioning and handing over in perfect working condition **3-Nos. 2x120 KVA, 3-phase, 50hz, 415V parallel active redundant uninterruptible power supply (UPS)** with 20 min battery backup time @ each UPS in RTV Complex (Chiller plant area (UPS Room-03), TVC – Bas. (UPS Room-04)) And Al Salmiya building to replace the existing UPS.

3.3 Supply, installation, testing, commissioning and handing over in perfect working condition **1-No. 250A, 3-phase, 50hz, 415V Static Transfer Switch (STS)** in Chiller plant area (UPS Room-03), To replace the existing STS, and new STS must be matching with the existing STS in the space and the entry of cables.

3.4 Supply, install, test, and commission of **Remote audible/visual alarm** complete With wiring, conduits and accessories for each UPS and STS in the data center at the second Basement of the administration building and Al Salmiya building.

3.5 Supply, install, terminate, connect, test, and commission **2 Nos Input and Output cubical switchboards** for new UPS system at Al Salmiya building, as per site condition and instructed by MOI engineer.

3.6 Supply, install, terminate, connect, test, and commission of all services required for batteries such as breakers, cables racks.....etc.

3.7 Supply, install, terminate and connect Cables and cabling works required for Complete the work satisfactorily.

3.8 Provision all necessary materials to replacement the UPS's without power

interruption on existing loads, that shall include Supply, install, terminate, connect, all temporary panels, cables, batteries and all materials required to ensure no power outage, as per asked by MOI engineer.

#### **4. TECHNICAL SPECIFICATION FOR SOLID STATE UNINTERRUPTIBLE POWER SUPPLY:**

##### **PART 1 - GUIDE SPECIFICATION**

###### **1.01 SUMMARY**

- A. This specification describes a three-phase continuous duty, on-line, double conversion, solid-state uninterruptible power system, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to provide power conditioning, back-up and distribution for critical electrical loads. The UPS shall consist of, as required by the project, the UPS module, VRLA batteries on racks, cabinet for maintenance bypass, and distribution applications (tie panel) as described in this specification.

###### **1.02 UPS SYSTEM DESCRIPTION**

- A. UPS System Components: The UPS system shall consist of the following main components:
  - 1. UPS module containing Rectifier(s), Inverter(s), Battery Charger(s), Static Bypass, and associated Control and Monitor Panel.
  - 2. VRLA Battery string(s) on Battery Racks.
  - 3. Line-and-Match cabinets for maintenance bypass, parallel tie and distribution applications.
- B. UPS Module Modes of Operation: The UPS Module shall operate as an on-line, fully automatic system in the following modes:
  - 1. Normal: Utilizing commercial AC power, the critical load shall be continuously supplied by the Inverter. The Inverter shall power the load while regulating both voltage and frequency. The Rectifier shall derive power from the commercial AC source and shall supply DC power to the Inverter. Simultaneously, the Battery Charger shall charge the battery.
  - 2. Battery: Upon failure of the commercial AC power, the critical load shall continue to be supplied by the Inverter, which shall obtain power from the batteries without any operator intervention. There shall be no interruption to the critical load upon failure or restoration of the commercial AC source. The UPS shall be capable of operating with 480VDC battery systems.

3. Recharge: Upon restoration of the AC source, the Charger shall recharge the batteries and simultaneously the Rectifier shall provide power to the Inverter. This shall be an automatic function and shall cause no interruption to the critical load.
4. Bypass: If the UPS module must be taken out of the Normal mode for overload, load fault, or internal failures, the static bypass switch shall automatically transfer the critical load to the commercial AC power. Return from Bypass mode to Normal mode of operation shall be automatic. No-break transfer to and from Bypass mode shall be capable of being initiated manually from the front panel.
5. Energy Saver: The UPS shall continuously monitor the voltage and frequency of the bypass source. When the source parameters are within acceptable limits, the UPS will utilize a minimal/optimal combination of its internal subsystems to ensure acceptable power is always delivered to the critical load, at a system efficiency of up to 99%. The Energy Saver System shall be enabled by the user, and shall be adjustable. It shall incorporate a “High Alert Mode” to automatically (without user intervention) provide maximum power conditioning any time bypass source variation levels exceed preset, adjustable limits. When Energy Saver System is utilized, the UPS shall attenuate ANSI C62.41-type line transients to within IEC and ITIC limits. The Energy Saver System shall be able to distinguish between upstream (utility) faults and downstream (load) faults, and react appropriately to protect and support the critical load, without interruption.

### 1.03 REFERENCES

- A. UL 1778 (Underwriters Laboratories) – Standard for Uninterruptible Power Supply Equipment. Product safety requirements for the United States, 4<sup>th</sup> Edition.
- B. CSA C22.2 No 107.1(Canadian Standards Association) – Commercial and Industrial Power Supplies. Product safety requirements for Canada.
- C. NEMA PE-1 – (National Electrical Manufacturers Association) – Uninterruptible Power Systems standard.
- D. IEC 62040-2 C3
- E. IEC 62040-3 (International Electrotechnical Commission) – Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements.
- F. IEEE 587 (ANSI C62.41) Category A & B (International Electrical and Electronics Engineers) – Recommended practices on surge voltages in low voltage power circuits.
- G. CISPR 22 and 24, FCC Rules and Regulations 47, Part 15, Class A (Federal Communications Commission) – Radio Frequency Devices.

### 1.04 SUBMITTALS



- A. The UPS shall be supplied with sufficient documentation, including the following manuals:
  - 1. Installation and Operation Manual: One copy of the installation and operation manual shall be furnished. It shall possess sufficient detail and clarity to enable the owner's technicians or representatives to install and operate the UPS equipment and accessories. The manual shall include the following major items:
    - a) UPS description
    - b) UPS site planning and unpacking
    - c) UPS installation
    - d) Optional accessory installation
    - e) UPS theory of operation
    - f) Operating procedures
    - g) System events
    - h) UPS maintenance
    - i) Performance and technical specifications
    - j) Wiring requirements and recommendations
    - k) Physical features and requirements
    - l) Cabinet dimensions

#### 1.05 QUALIFICATIONS

- A. The UPS manufacturer shall have a minimum of fifty years' experience in the design, manufacture and testing of solid-state UPS systems. A list of installed UPS systems of the same type as the manufacturer proposes to furnish for this application shall be supplied upon request.
- B. The UPS manufacturer shall have ISO 9001 certification for engineering/R&D, manufacturing facilities and service organization.
- C. The UPS manufacturer shall maintain a staffed 7x24x365 call center for technical and emergency support.
- D. Field Engineering Support: The UPS manufacturer shall directly employ a nationwide field service department staffed by factory-trained field service engineers dedicated to startup, maintenance, and repair of UPS equipment. The organization shall consist of local office managed from Middle East regional office. Field engineers shall be deployed in the areas to provide on-site emergency response within 24 hours. A map of Kuwait showing the location of all field service office shall be submitted with the proposal. Third-party service or maintenance will not be accepted.
- E. Spare Parts Support: Parts supplies shall be located in the field to provide 80% of all emergency needs. Parts are stocked in regional logistics centers, ensuring a 95% First Time Fix rate and maximizing system availability.

- F. Product Enhancement Program: The UPS manufacturer shall make available feature upgrade service offerings to all users as they are developed. These upgrades shall be available as optional field-installable kits.
- G. Maintenance Contracts: A complete range of preventative and corrective maintenance contracts shall be provided and offered with the proposal. Under these contracts, the manufacturer shall maintain the user's equipment to the latest factory revisions.

## 1.06 ENVIRONMENTAL REQUIREMENTS

- A. The UPS shall withstand any combination of the following external environmental conditions without operational degradation.
  - 1. Operating Temperature: 5 degrees C to + 40 degrees C (41 degrees F to 104 degrees F) without de-rating (excluding batteries).
  - 2. Storage Temperature: - 25 degrees C to + 55 degrees C (-13 degrees F to 131 degrees F). Prolonged storage above + 40 degrees C (104 degrees F) will cause rapid self-discharge and permanent damage to the battery.
  - 3. Relative Humidity (operating and storage): 5-95% non-condensing.
  - 4. There shall be at least a 1.8<sup>0</sup>F (1.0<sup>0</sup>C) difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non-condensing environment
  - 5. The maximum rate of temperature change shall be limited to 3<sup>0</sup>F over 5 minutes (36<sup>0</sup>F/hour), based on the ASHRAE Standard 90.1-2013
  - 6. Elevation:
    - a) Operational: 3300 ft. (1000 m) maximum without de-rating. Above this rating, altitude de-rating as per IEC 62040-3
    - b) Transportation: Capable of air transport, up to 15,000m.

## 1.07 SAFETY

- A. The UPS shall be certified by Underwriters Laboratories in accordance with UL 1778, 4<sup>th</sup> Edition.
- B. The UPS shall be certified by the Canadian Standards Association in accordance with CSA C22.2 NO.107.1-M91.
- C. Cabinet shall be NEMA 1 and IP20 rated

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

**A. Approved Manufacturers:**

- Eaton.
- Schneider Electric.
- General Electric.

### **2.02 UPS MODULE STANDARD FEATURES**

The UPS module shall consist of the following standard components, housed in a 120kW frame:

**A. Three identical 40kW UPM Universal Power Modules, each containing:**

1. **Rectifier/Charger:** The rectifier/charger shall convert incoming AC power to regulated DC output for supplying the inverter and for charging the battery. The rectifier/charger shall be a high-frequency PWM design, using Insulated Gate Bi-polar Transistors (IGBTs). The modular design of the UPS shall permit safe and fast removal and replacement of the rectifier/charger module. Mean time to repair (MTTR) for the module shall be no more than 30 minutes in order to return UPS to normal mode. The rectifier/charger module shall also provide the following:
  2. The rectifier shall be capable of drawing power from the utility with a power factor of 0.99 under nominal conditions.
  3. The rectifier shall feature protection circuitry that prevents the IGBTs from sourcing current in excess of their published ratings.
4. **Inverter:** The inverter shall feature an IGBT pulse-width-modulation (PWM) design with high speed switching. The inverter shall also have the following features:
  5. The inverter shall be capable of providing the specified quality output power while operating from any DC source voltage (rectifier or battery) within the specified DC operating range.
  6. The modular design of the UPS shall permit safe and fast removal and replacement of the power module, while in maintenance bypass. Mean time to repair (MTTR) for the module shall be no more than 30 minutes in order to return UPS to normal mode.
  7. The inverter shall feature protection circuitry that prevents the IGBTs from sourcing current in excess of their published ratings.

**B. Static Bypass:** The bypass shall serve as an alternative source of power for the critical load when an abnormal condition prevents operation in normal mode. The bypass for 120kW frames shall consist of a fully rated, continuous duty,

naturally commutated static switch for high-speed transfers. The bypass shall feature the following transfer and operational characteristics.

1. Transfers to bypass (for stand alone, and parallel capacity systems) shall be automatically initiated for the following conditions:
  - a) Output overload period expired.
  - b) Critical bus voltage out of limits.
  - c) Internal over temperature period expired.
  - d) Total battery discharge.
  - e) UPS failure.
2. Parallel Redundant UPS systems shall transfer to bypass on conditions (a), (b), and (d) above. Conditions (c) and (e) will result in the affected UPS isolating itself from the parallel bus, allowing the remaining UPS(s) to support the critical load.
3. Uninterrupted automatic re-transfer shall take place whenever the inverter(s) is capable of assuming the critical load.
4. Uninterrupted automatic re-transfers shall be inhibited for the following conditions:
  - a) When transfer to bypass is activated manually or remotely.
  - b) In the event of multiple transfers/re-transfer operations the control circuitry shall limit “cycling” to three (3) operations in any ten-minute period. The third transfer shall lock the critical load on the bypass source, for 60 minutes.
  - c) UPS failure.
5. Uninterrupted manual transfers shall be initiated from the control panel. Uninterrupted manual transfers to bypass and from bypass shall be possible with the inverter logic. During manual transfers to bypass mode, the inverter must verify proper bypass operations before transferring the critical load to the bypass.
6. All transfers to bypass shall be inhibited for the following conditions:
  - a) Bypass voltage out of limits (+10%, to -10% of nominal)
  - b) Bypass frequency out of limits (+/- 4 Hz, adjustable, factory set)
  - c) Bypass out of synchronization
  - d) Bypass phase rotation / installation error
7. Static transfer time: No break, complete in less than 4ms.
8. The bypass shall be manually energized using the control panel or remotely through a building alarm input.

- C. Monitoring and control components: The following components shall provide monitor and control capability:

1. Control panel: color LCD, touch sensitive, with LED status indicators.
  2. Alarm and metering display.
  3. Building alarm monitoring.
  4. Communication ports: RS-232 and USB.
- D. Battery management system: The UPS shall contain a battery management system for VRLA batteries, which has the following features when used with lead acid batteries:
1. The battery management system shall provide battery time remaining while operating in normal mode and battery mode. Battery time available information shall be displayed real-time, even under changing load conditions. Upon commissioning, battery runtime information shall be available.
  2. The battery management system shall automatically test the battery system to ensure that the battery is capable of providing greater than 80% of its rated capacity. Testing the batteries shall not jeopardize the operation of the critical load. Upon detection of the battery string(s) not capable of providing 80%, the UPS system will alarm that the battery needs attention/replacement. The battery test shall be able to detect the following:
    - a) Open battery string
    - b) Shorted battery string (current limit)
    - c) Battery capacity (runtime) less than 80% of “new” battery capacity
- E. Wiring Terminals: The UPS 120kW frame modules shall contain mechanical compression terminals (adequately sized to accommodate 75 degree C wiring), for securing user wiring to the following locations:
1. Rectifier/charger input connections (for dual source configurations): 3-wire plus ground.
  2. Bypass input connections: 4-wire plus ground.
  3. DC link connections for battery cabinets (positive and negative plus ground).
  4. AC output connections 3-wire plus ground, or 4-wire plus ground.

## 2.03 UPS MODULE INTEGRATED ACCESSORIES

The UPS system include the following accessories:

- A. Integrated Maintenance Bypass Cabinet(s): Integrated Line-and-Match cabinet(s) shall be provided that include(s):
1. All hardware and interconnecting cable for connection to UPS module.

2. IAC-B (Bypass) Sidecar: four-breaker manual maintenance bypass switch in a sidecar configuration, to isolate UPS module from commercial AC input and critical load. The sidecar may be mounted on either side of the UPS module. Switch shall provide complete isolation of UPS for servicing. Switch shall be make-before-break, interlocked between UPS and bypass to prohibit improper operation.
- B. Network Adapter and UPS Power Monitoring Software: Optional PX Gateway card adapter shall provide a communications interface between the UPS module and the following network management systems.
1. SNMP v.1, v.3
  2. Modbus TCP
  3. BACnet/WS or /IP
  4. IPv6
- This capability shall allow the unit to be monitored remotely over an Ethernet network using a standard web browser.
- C. UPS Power Monitoring Software: This system shall continuously monitor critical power elements associated with the UPS, using the communications port on each module and a customer furnished PC. The system shall automatically alarm if any problems arise and notify local or remote personnel of the alarm condition via email, page, or text message.
- D. Relay Card: Serial dry contact card providing 4 isolated dry output contacts, 1 isolated input. The relays are programmable.
- E. External VRLA Battery Racks: The battery racks shall feature valve regulated, high-rate discharge, lead-acid batteries which provide energy to the support the critical load during a momentary loss of input power to the rectifier. The batteries shall be flame retardant in accordance with UL 94V2 requirements. The battery racks shall have the following features:
1. Configurable in systems from 48V-480V.
  2. Racks are free standing.
  3. Racks can be arranged in back-to-back or end-to-end configurations.
  4. High-quality construction guarantees longer life.
  5. Heavy duty acid-resistant coating is scratch-resistant and chip proof.
  6. Steel welded construction.
  7. Cable kits include all cables necessary for string connections.
  8. Seismically Certified, Meets seismic requirements for IBC2006.
  9. For parallel systems, each UPS frame shall have a discrete battery system. A single battery system may not be shared across multiple UPS frames.
  10. Battery rack for each UPS module shall feature a DC rated circuit breaker. The circuit breaker for the battery rack shall only provide protection to the battery string(s).

G. Parallel Systems (120kW models): Up to 8 UPS modules (UPS “frames”) may be paralleled for N+X redundancy, and/or for increased capacity. Maximum capacity in a parallel-for-capacity system is 960kW.

1. UPS frames are not required to be identical in terms of quantity of internal UPMs. For example, a 40kW UPS may be paralleled with an 80kW UPS.
2. Additional 40kW UPMs may be field-added to any UPS frame in a parallel system.
3. Each UPS frame must have a dedicated battery system, or DC storage system.
4. Each UPS will contain a built-in circuit (Control Area Network, or CAN) for communication of metering and status information between UPS frames. This will not require the use of a separate communication card. Interruption of the CAN bus will not cause the parallel system to fail to support the critical load.
5. Load share balance will be within +/-5% of full load rating.
6. For 2-UPS parallel systems, a sidecar cabinet shall be available to provide 2x module output breakers, maintenance bypass (MBS) and maintenance isolation (MIS) switches. This cabinet will be wired and tested with one UPS at the factory, and shall ship attached to that UPS.

#### 2.04 UNINTERRUPTIBLE POWER SUPPLY RATING:

A. UPS Continuous Ratings (120kW).

Units may be upgraded to their maximum UPS frame rating when sufficient UPMs are installed and appropriate firmware settings are implemented.

UPS Rating (max) is the maximum output possible from the UPS (for a load power factor range of 0.8 lagging to 0.8 leading). The UPS shall not require de-rating when supporting a leading or lagging power factor load of 0.8 or greater.

The UPS can be later upgraded to its corresponding maximum frame rating. The wiring size in the building must be connected for the maximum possible rating of the UPS (i.e. to match the UPS frame rating).

B. Acceptable UPS input sources:

1. Nominal three phase input voltage: 380/220Vac, 400/230Vac, or 415/240Vac.
2. Operating input voltage range: +10%, -10% of average nominal input voltage without battery discharge. Note the UPS shall “power share” with the battery to -30% of nominal voltage, at full rated load.
3. Operating input frequency range shall be 40 to 72Hz.
4. Input power factor 0.99 lagging at rated load.

5. Normal input current limit: The UPS shall have the following programmable input current limit settings while operating in normal mode:
  - a) Rectifier/charger input current limit shall be adjustable from 100 to 115% of UPS kW rating.
  - b) Battery input current limit shall be adjustable from 0 to 16.5A per 40 kW UPM module. This limit may be extended to 29.3A for loads less than 80%.
6. On generator input current limit: The UPS shall have the following programmable input current limit settings while operating in normal mode on generator:
  - a) Rectifier/charger input current limit shall be adjustable from 100% to 115% of UPS full load kW rating.
  - b) Battery recharge input current limit shall be adjustable from 0 to 16.5A per 40kW UPM module. This limit may be extended to 29.3A for loads less than 80%.
7. Input current total harmonic distortion (THD) shall be less than 3% at nominal line voltage and 5% nominal source impedance.
8. Power walk-in: Ramp-up to full utility load adjustable from 10 amps per second to 1 amp per second.

C. Bypass input:

1. Synchronizing bypass voltage range shall be +10, -10% of average nominal input voltage.
2. Synchronizing bypass frequency range is +/- 0.5 Hz to +/-4 Hz, user adjustable, and is centered on the nominal frequency. Default setting is +/- 4 Hz.
3. Slew rate: 0.5 Hz per second, maximum.
4. Bypass and rectifier inputs can be supplied from out of phase sources if required.
5. Input surge withstand capability: The UPS shall be in compliance with IEEE 587 (ANSI C62.41), category A & B (6kV).

D. Rectifier/charger output:

1. Nominal DC voltage shall be 480 VDC (open circuit battery voltage).
2. Capacity: The rectifier/charger shall support a fully loaded inverter and recharge the battery to 90% of its full capacity within 10 times the discharge when input current limit is set at maximum.
3. Low line operation: The rectifier/charger shall be capable of sharing the DC load with the battery when the input voltage falls below the specified operation input voltage range, the "on battery" indicator shall annunciate operation in this mode.



4. DC sensing: DC voltage sensing methods shall be incorporated for providing battery over-voltage protection.
5. Battery charger characteristics: The UPS battery charging system shall have the following characteristics:
  - a) The charger shall be capable of being configured for several charge modes including:
    - (1) A charging mode that increases battery life by allowing the battery to rest, reducing positive plate corrosion
    - (2) A charging mode floating the battery at a set level, which can be adjusted via software.
  - b) UPS module will automatically adjust battery shutdown based upon loading and battery capacity.
    - (1) The UPS module shall automatically adjust the final discharge voltage between 1.67 and 1.75 Volts per cell based on the existing load and the rate and length of discharge.
    - (2) The absolute minimum operational voltage is 1.67 V per cell (adjustable upward).

E. UPS output in normal mode

1. For 3-wire models, nominal output voltage 380/400/415V, 3-phase, 3-wire plus ground at the UPS output terminals, or 4-wire plus ground at the output terminals.
2. Steady-state voltage regulation (in inverter) shall be within +/- <1% average from nominal output voltage.
3. Transient voltage response shall be per EN62040-3, Class 1, VFI-SS-111.
4. Transient voltage recovery shall be compliant to EN62040-3, Class 1, VFI-SS-111.
5. Linear load harmonic distortion capability: Output voltage THD of less than 1% for 100% linear load.
6. Non-linear load harmonic distortion capability: Output voltage THD of less than 5% for 100% non-linear load when tested using the non-linear load described in IEC 62040-3.
7. Line synchronization range shall be +/- 4Hz, adjustable to +/-0.5 Hz.
8. Frequency regulation shall be +/- 0.1Hz free running.
9. Frequency slew rate shall be 0.5 Hz/second maximum.
10. Phase angle control:
  - a) Balanced linear load shall be <1 degree from nominal 120 degrees
11. Phase voltage control:

- a) Balanced linear loads shall be +/- 1% from average phase voltage
  - b) Unbalanced linear loads shall be less than <2% from average phase voltage for 100% load unbalanced
12. Overload current capability (with nominal line and fully charged battery, non-paralleled systems):
- a) Double Conversion mode: The unit shall maintain voltage regulation for 102% to <110% of resistive/inductive load for 10 minutes, 111% to <125% for 60 seconds, and 126% to 150% for 10 seconds, >151% for 300ms.
  - b) Stored energy mode (typically on battery): The unit shall maintain voltage regulation for 102% to <110% of resistive/inductive load for 10 minutes, 111% to <125% for 60 seconds, and >126% for 300ms
  - c) Energy Saver System operation: Continuous = 110%. Transient = 1000% peak current for 10ms.
  - d) On bypass (single UPS systems): Continuous = 125%. Transient = 1000% peak current for 10ms.
13. Fault clearing current capability: As per section 12 above.
14. Static transfer time, inverter to bypass: No break, completed in less than 4ms.
15. Static transfer time, Energy Saver to inverter: No break, completed in less than 4ms maximum, typically <2ms.
16. Common mode noise attenuation:  
-65dB up to 20kHz, -40db up to 100kHz
17. Acoustical noise: Noise generated by the UPS under normal operation shall not exceed 65dbA at one meter from any operator surface, measured at 25 degrees C (77 degrees F) and full load, per ISO 7779 standard.
18. EMI Suppression: The UPS shall meet FCC rules and regulation 47, part 15, for Class A devices, CISPR22, and IEC62040-2 C2 and C3.
19. Electrostatic discharge (ESD): The UPS shall meet IEC61000-4-2 level 3; 4kV contact/8kV air discharge.
20. Efficiency: The UPS incorporate 3-level power converter design for highest possible efficiency. Full load efficiency for non-derated hardware shall be up to 97%, 50% load efficiency shall be 96.5%, and the UPS shall achieve >95.0% efficiency at 25% load. These numbers are for N+0 configurations only.

#### F. UPS Output with Energy Saver System option

- 1. The Energy Saver System acts to optimize the internal components of the UPS power train to maximize system efficiency when the bypass source is within the following (adjustable) limits: Voltage: +/-10%, and Frequency: +/-3Hz.

2. For 3-wire models, nominal output voltage 380/400/415V, 3-phase, 3-wire plus ground at UPS output terminals, or 4-wire plus ground at the output terminals. Steady-state voltage regulation shall be within +/- 10% from nominal output voltage.
3. Line synchronization range shall be +/- 4 Hz, adjustable.
4. Frequency regulation shall be +/-4 Hz when bypass source is within the limits in (1) above, and +/- 0.1Hz free running,
5. Overload current capability (with bypass source within the limits of (1) above) Continuous: 110%, Transient: 1000% for 10msec.
6. Static transfer time: No break, typically completed in less than 2ms, including detection time.
7. Acoustical noise: Noise generated by the UPS under normal ESS operation shall not exceed 47dbA at one meter from any operator surface, measured at 25 degrees C (77 degrees F) and full load.
8. EMI Suppression: The UPS shall meet FCC rules and regulation 47, part 15, for Class A devices, CISPR22, and IEC62040-2 C2 and C3.
9. Electrostatic discharge (ESD): The UPS shall meet IEC61000-4-2 level 3; 4kV contact/8kV air discharge.
10. Efficiency: The UPS efficiency shall greater than 99%, over the range of 25% to 100% load; for N+0 configurations only.

\*performance data in Sec 2.05 above is measured under conditions of 100% resistive load for fully rated UPS sizes, 25 degrees C ambient temperature, nominal rectifier and bypass input voltages, and battery system floating.

## 2.05 MECHANICAL DESIGN

- A. Enclosures: The UPS shall be housed in free-standing double front enclosures (safety shields behind doors) equipped with casters and leveling feet. The enclosures shall be designed for computer room applications. Front doors shall have locks to prevent unauthorized entry.
- B. Modular construction: The UPS shall be comprised of Universal Power Modules (UPMs), each hardware-rated for 40kW, and each including the rectifier, inverter, and battery converter power and control circuitry. These UPMs shall be draw-out assemblies that can be quickly exchanged or replaced as necessary without interruption.
- C. Ventilation: The UPS and shall be designed for forced-air cooling. Air inlets shall be on the front of the unit. Air outlet configuration for the UPS, and its accessory cabinet(s) shall be user selectable at time of order to exhaust warm air at the top of the cabinet (row or wall installations), or exhaust at the rear of the cabinet for "hot aisle" configurations. Eighteen inches of clearance over the UPS outlets shall be required for proper air circulation (top exhaust), or working space (rear exhaust). An air filter shall be mounted in the front door of the UPS module.

- D. No back or side clearance or access shall be required for the system. The back and side enclosure covers shall be capable of being located directly adjacent to a wall.
- E. Cable entry: cable entry for the UPS cabinet shall be through the enclosure bottom.
- F. Front access: All serviceable subassemblies shall be modular and capable of being replaced from the front of the UPS (front access only required). Side or rear access for installation, service, repair or maintenance of the UPS system shall not be required.
- G. Service area requirements: The system shall require no more than thirty-six (36) inches of front service access room and shall not require side or rear access for service or installation.

## 2.06 CONTROLS AND INDICATORS

- A. Microprocessor controlled circuitry: The UPS controls shall have the following design and operating characteristics:
  - 1. Fully automatic operation of the UPS shall be provided through the use of microprocessor controlled Digital Signal Processing. Start-up and transfers shall be automatic functions, and will not require operator intervention.
- B. Digital Front Panel Display: The UPS control panel shall be a 7" touch sensitive, backlit LCD front panel display that includes LED indicators for basic UPS status. Large, luminous, color coded LED pillars (vertical bars) shall show the UPS status (green, amber, red), and be visible up to 30m from the UPS. The LCD shall display:
  - 1. UPS status (home screen): the LCD screen shall have a color-coded border (header) that turns red on alarm, and shows basic UPS status in the header of the display, visible at all times. The header shall alternately show UPS status output voltage and battery time remaining, and be visible constantly in all display screens. The home screen shall show load level, average efficiency, and power consumption in kWh. The home screen shall show a system mimic diagram with a color-highlighted power path, operating mode, and active events.
  - 2. Controls tab: Shall provide touch sensitive button controls, with a confirm prompt, for turning the UPS on and off, transfer to/from bypass, and enabling or disabling the battery charger, initiating a battery test, and enabling or disabling Energy Saver System (ESS).
  - 3. Metering tab: The metering screen shall show voltages currents, temperatures, kW, kVA, and power factor (as applicable) for the UPS input, output, bypass source, and battery. Color coded (green, amber, red) bar graph indicators will accompany power and temperature measurements

4. Logs tab: alarm/event queue, active alarms and alarm history, events, status changes and commands, all timed to the 1/1000<sup>th</sup> second for tracking and analysis.
  5. Statistics tab: Numerically and graphically displays the estimated savings afforded by ESS operation over time.
  6. Settings tab: shall provide button access to user adjustable settings such as, but not limited to: date/time, building alarm designations, communications parameter setup, UPS name, user passwords, and display language.
- C. Control Panel Lamp Indicators: The UPS control panel shall provide the following monitoring functions with indicator (icon) LED's:
1. NORMAL: This green LED shall indicate that the commercial AC utility or generator source is supplying power to the rectifier and the inverter is supporting the critical load.
  2. BYPASS: This amber LED shall indicate that the UPS has transferred the load to the bypass circuit.
  3. BATTERY: This amber LED shall indicate that the commercial AC utility or generator source has failed and the battery is supplying power to the inverter, which is supporting the load.
  4. ALARM: This red LED and the accompanying audible alarm horn, shall indicate that the UPS detects an alarm condition, outlined in detail in the Logs tab from the home screen and in the operator's manual.
- D. Interface panel: The UPS shall be equipped with an interface panel, located behind a protective cover, which provides the following signals and communication features in a Class 2 environment:
1. Alarm contact: A dry contact for annunciating a summary alarm shall be provided for customer use. This contact shall be Form "C" capable of supplying both N/O and N/C contacts. Contact ratings shall be 5A max at a voltage not to exceed 28VDC or 277VAC.
  2. RS232 (EIA / TIA-232) and USB communications interfaces: Circuitry shall be provided for one "host", and one "device" USB connector, and one RS232 (EIA / TIA-232) communication port for connection to automated service department diagnostic tools. This port may be used with simple ("dumb") terminals to gain remote access to all unit operation information.
  3. Building alarms: Five inputs shall be provided for monitoring the status of external dry contacts. Building alarms shall be set up through the UPS configuration mode function on the UPS front panel display or via the RS232 (EIA / TIA-232) port.
  4. External REPO contacts: Shall be provided to connect an external remote emergency power off switch to shut down the UPS and de-energize the critical load. Normally open or normally closed contacts shall be acceptable.

5. Battery control contacts: Contacts shall be provided to connect the battery shunt trip and auxiliary contact signals from a battery breaker or battery disconnect switch.
6. External bypass indicator connection: A connection point shall be provided to acknowledge that an external maintenance bypass has been closed around the UPS, placing the critical load on utility power.

## 2.07 COMMUNICATIONS

- A. Communications Bay: The UPS shall be equipped with field configurable communications bays that will accommodate four (4) plug-in communication devices
- B. Remote Monitoring:
  1. WEB/SNMP communication capabilities will be available for all systems.
  2. The UPS shall be able to be monitored remotely via communications devices. UPS manufacturer shall provide communications devices capable of communicating via various industry standard protocols such as RS232, SNMP, BACnet and ModBus. Monitoring of UPS status may also be performed through isolated dry contact Form C relays.

The UPS communication capability should be able to integrate into any industry standard Building Management System (BMS) and/or Network Management System (NMS). The UPS must also be able to be monitored via any standard Internet browser.

All hardware interfaces shall be “Hot-swappable” (UPS maintains power to critical applications while changing interfaces).

- C. Shutdown:
  1. There shall be a mechanism that provides graceful, orderly, unattended, sequential shutdown of one or multiple computers powered by one UPS. This shutdown shall be performed via in-network or out-of-network means. The order of shutdown shall be user-defined, allowing the maximization of runtime on battery for more critical systems.
  2. The UPS shall also be capable of interfacing with an operating system’s built-in shutdown routine. This shall be done through a cable connection to the communication interface card.
- D. Notification:
  1. There shall be a mechanism to send alerts to key personnel via email or SNMP traps. An alarm notification may also be sent by a network message.

## 2.08 UPS MODULE PROTECTION

- A. Rectifier/Charger and Bypass protection shall be provided through individual fusing of each phase.

- B. KAIC rating: 100kAIC.
- C. Battery protection shall be provided by thermal-magnetic molded-case circuit breakers for each battery rack.
- D. Electronic current limiting circuitry and fuses in the Inverter circuit shall provide output protection.
- E. To comply with agency safety requirements, the UPS module shall not rely upon any disconnect devices outside of the UPS module to isolate the battery cabinet from the UPS module.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

### **3.02 COMMISSIONING**

- A. Factory start-up shall be provided on 7 x 24 basis. Start-up service shall be provided at no extra charge and shall include one visit to perform all procedures and tests specified within UPS Installation and Operation manual. UPS manufacturer shall also offer the following optional services:
  - 1. Pre-energize visit to inspect installation and provide guidance to installers as required.
  - 2. Post-start-up visit for alarm notification configuration, operator training, UPS testing, etc.
- B. The following procedures and tests shall be performed by Field Service personnel during the UPS startup:
  - 1. Visual Inspection:
    - a) Visually inspect all equipment for signs of damage or foreign materials.
    - b) Observe the type of ventilation, the cleanliness of the room, the use of proper signs, and any other safety related factors.
  - 2. Mechanical Inspection:
    - a) Check all the power connections for tightness.
    - b) Check all the control wiring terminations and plugs for tightness or proper seating.
  - 3. Electrical Pre-check:
    - a) Check the DC bus for a possible short circuit.
    - b) Check input and Bypass power for proper voltages and phase rotation.

- c) Check all lamp test functions.
- 4. Initial UPS Startup:
  - a) Verify that all the alarms are in a “go” condition.
  - b) Energize the UPS module and verify the proper DC, walkup, and AC phase on.
  - c) Check the DC link holding voltage, AC output voltages, and output waveforms.
  - d) Check the final DC link voltage and Inverter AC output. Adjust if required.
  - e) Check for the proper synchronization.
  - f) Check for the voltage difference between the Inverter output and the Bypass source.
  - g) On site full-load, step-load, and battery discharge tests using supplier furnished load bank, shall also be offered.
- 5. Operational Training: Before leaving the site, the field service engineer shall familiarize responsible personnel with the operation of the UPS. The UPS equipment shall be available for demonstration of the modes of operation.

### 3.03 WARRANTY

All components of the UPS system shall be covered by a standard Two-year limited factory warranty and service protection package.

Two-year limited factory warranty shall include replacement coverage for the UPS parts for a period of 24 months from start-up, whichever occurs sooner. Labor coverage is for 2 years after product startup.

Two-year service protection package shall include 7x24 on-site repair/replacement labor for UPS parts and batteries; 7x24 technical support coverage; and 7x24 remote monitoring service (with monthly reports for UPS and battery performance). Standard response time shall be 2 hours from receipt of call. Also, 7x24 on-site service support with guaranteed response times of 2 hours in sites. Preventive maintenance visits shall be available for UPS and battery components.

Start-up services consisting of: 7x 24 Start-up service of UPS and batteries. On-site user training, Site Audit, installation and commissioning of monitoring service, and validation of two-year limited factory warranty will be performed during the start-up.

Provide service 7x24 on-site coverage (preventive and corrective) for UPS and batteries, guaranteed response time, remote monitoring, Web access to service site history, annual Site Audit, UPS and battery preventive maintenance visit, and discounts on upgrade and modification kits. Also battery service plan to provide parts-and-labor coverage for partial and full battery strings, either with preventive maintenance or replacement coverage.



## **5. TECHNICAL SPECIFICATION FOR STATIC TRANSFER SWITCH (STS):**

### **PART 1 – GENERAL**

#### **1.1 Features and benefits.**

- **Redundant power supply and enhanced distribution.**
- **3 phase no transient cross conduction, ultra-fast static transfer switch meets the requirements of Tier IV datacenter architectures, providing distribution redundancy and easy site management.**

Simplifies installation and maintenance, while minimizing space requirements.  
Independent control boards and dual cooling systems and power supplies ensure high reliability performance.  
Text and mimic diagrams display modes of operation, system parameters and alarms.  
Allows isolation of a source for maintenance, without interrupting power to the protected loads.  
Small footprint reduces required floor space.
- **High availability of energy.**

Compliant with data center TIA 942 and TIER IV requirements.  
STS supplies power to a range of equipment from two independent and redundant sources without disconnection, it transfers the supply from a preferred source to a alternate source, in either automatic or manual mode.
- **Zero-disconnection' transfer**

STS uses “no transient cross conduction” technology. This ‘non-overlap’ principle ensures that the sources are not placed in parallel at the moment of transfer, thus eliminating the risk of a fault being propagated between the sources. The performance characteristics of the STS guarantee a typical transfer within 5 ms, well within the time recommended in the Information Technology Industry Council (STS international Standard CEI 62310-3) Guide.
- **Redundancy of distribution and segmentation of loads**

STS facilitates the design of "very high availability“ architectures by extending power distribution system redundancy closer to the protected items of equipment. This inherently creates small clusters of loads, simplifying management of the power infrastructure.
- **Ease of operation**

LCD Multilanguage graphics display for rapid acquisition of measurements and straightforward access to static transfer switch settings.  
Animated mimic diagram on the front panel for immediate viewing of the energy flows and states.  
Specific Bypass Procedure diagram.  
Dedicated terminals provided to facilitate load bank testing.  
Jbus/ModBus Serial interface card provides a PC interface, a relay communication card delivers configurable remote monitoring capability, and an optional XML web card enables Ethernet connectivity

Optional STS network management card (NMC) provides SNMP and ISX Central Interface Compatibility. This allows users to monitor STS and all ISX compatible components through a common user friendly interface.

- **Increased safety and Maintainability**

STS can be used to isolate a line which has been scheduled for maintenance, without interrupting the power supply to the protected load. Safety and security features include bypass switches with mechanical interlocks, key lockable load disconnect switches, and password enabled manual transfers.

- **Compact size**

The compact "footprint" of the STS allows for maximum utilization of available space.

## **1.2 Principal functions**

Selects the best of 2 sources, based on the continuous monitoring of 11 parameters.

Automatic or manual transfer and return without disconnection,

'Rolling synch.' function for back-up transfer of unsynchronized sources,

Built-in sub-system redundancy within the device (power supply, control, and ventilation),

Isolation switches for maintenance purposes,

4 slots to accommodate communication cards (2 of which are included:

JBus/ModBus card, status information card).

## **PART 2 – TECHNICAL CHARACTERISTICS**

### **2.1 Source Inputs**

- Nominal voltages 380 V (-35%) - 400 V – 415 V (+20%).
- Nominal frequency 50 Hz or 60 Hz (+/- 10%).
- Number of phases 3-Phase (3 + N + E or 3-phase + E).

### **2.2 Operation**

- Permissible overloads: 110% 15 minutes, 150% 2 minutes and 600% 20s.
- Efficiency (linear load & PF=0.8): 0.99.
- Transfer time: 5 ms (typical).

### **2.3 Environment**

- Operation: 0°C to 40 °C.
- Storage temperature: -20°C and +40°C.
- Noise level: < 60 dB.

### **2.4 Technical standards**

- Construction and safety: IEC 60950, GR-63-CORE.
- EMC: IEC 61000-6-4, IEC 61000-6-2, EN55011.
- Certifications: TÜV, CE.

## 6. BILL OF QUANTITY. (BOQ)

S.N.	DESCRIPTION	QTY	Unit	U-Price		T-Price	
				K.D	Fils	K.D	Fils
1.	Disconnect , dismantle , transport to MOI stores all replaced UPS and STS with related services	8	Nos.				
Supply, install, terminate, test, commission and handover as specified but not limited to the followings :							
2	Double modules UPS 2x120KVA, 3Ph,415/240V,50 Hz with static, maintenance bypass switch, parallel connected active redundancy and battery set 20 min. backup time @120KVA for each ups module as per specified.	3	Set.				
3	Static Transfer Switch STS 250A, 3Ph, 415/240V, 50 Hz with all accessories required as per specified.	1	No.				
4	IN/OUT Cubical Switchboards for UPS system at Al Salmiya building.	2	Nos.				
	Total Amount in (K.D, Fils)						
Total Amount in words, Kuwaiti dinars :  .....  .....  .....							

## 7- SITE VISIT STATEMENT

### محضر زيارة موقع الأعمال

State of Kuwait

وزارة الإعلام Ministry of Information

قطاع الشؤون الهندسية Engineering Affairs

ممارسة رقم : وأ - / .....

توريد وتركيب وتشغيل وضمان أجهزة عدم انقطاع للتيار (UPS)

بمجمع الاعلام ومبنى السائية

إنه في يوم ( الموافق / / 202 م ، وبحضور كل من :

عن وزارة الإعلام.

- 1 - .....
- 2 - .....
- 3 - .....

عن شركة / .....

- 1 - .....
- 2 - .....

تم زيارة موقع الأعمال والإطلاع على جميع الأعمال المطلوبة للممارسة أعلاه ، والرد على جميع الإستفسارات لدينا .