Tender # 12/2021

Additional Special Conditions

Off-Grid Photovoltaic system/ Sport Facility

Jdaidet Al Chouf -Lebanon

Prepared by

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National Energy Research Center

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1. Introduction

1.1 About MINARET Project

The MENA Region Initiative as a model of the NEXUS Approach to Renewable Energy Technologies" (MINARET), is a project aimed to address the following three key issues: renewable energy technology and energy efficiency, water management and food security with various cross cutting themes; Gender equality, Women empowerment and socio-economic dimension.

Many MENA countries, including Jordan, Lebanon and Tunisia are facing several challenges. These include a global economic downturn, regional upheavals and instability (such as the ongoing Syrian crisis), acute scarcity of energy and water resources, growing energy needs, and a fast-growing population that is demanding a better standard of living and adequate solutions to rising prices and unemployment. All of these challenges are significantly impacted by near total dependency on imported hydrocarbon energy sources as well as the arid and extremely variable climate, which are putting huge pressures on available energy, water and food resources.

2. RSS/NERC Energy Assessment Methodology

The energy assessment in Jdaidet Al-Chouf municipality in Lebanon was conducted by RSS/NERC team to evaluate the current situation for several municipality facilities and to identify the possible energy saving measures through the improvement of the energy efficiency in these facilities. Also, RSS/NERC team has identified the possible renewable energy systems that can be installed for these facilities.

Several meetings have been conducted with different stakeholders and the main entities within the municipality in order to collect needed information to evaluate the energy situation of the municipality.

3. Targeted Buildings/System

The implementation of the Photovoltaic system will be performed in the following Buildings/Systems:

- An Off-Grid Photovoltaic system with the ability to be connected to the grid at the Sport Facility as a canopy for the Amphitheater where the structure shall be a Cantilever Beam (One pole only).

4. Additional Special Conditions

1. The bidder shall provide at least **3 accomplished projects** related to the same field of the project, including a brief description about each project, budget and duration.

   ***** Note:*** *The company profile must include year of establishment and years of experience with official registration certificates, joint venture if applicable and reference projects with completion certificate. These projects shall be filled in "**Company Profile tables**" in **Annex A.1** enclosed.*

2. The bidder shall nominate technical team to perform the engineering, procurement, installation, construction and all supporting tasks in the project. The team shall include the following members at minimum:

   - A qualified **project manager** held responsible for managing all project components and activities during whole project period, with a minimum experience of 5 years in similar projects.
   - An **electrical engineer** held responsible for managing all electrical works with at least a B.Sc. in electrical engineering with a minimum experience of 2 years in similar projects.
   - A **civil engineer** held responsible for managing all civil works with at least a B.Sc. in civil engineering with a minimum experience of 2 years in similar projects.
   - **Technicians** held responsible for executing the required works with sufficient experience in similar projects.

***** Note:*** *Technical teams arrangement & selection, names and years of experience shall be filled in "**working team qualifications tables**" in **Annex A.1** enclosed.*

3. The bidder shall provide a description of the capabilities and experience of the proposed team and resumes of all key project personnel. All resumes shall be attached to ***Annex A.1***

4. All questions regarding the tender by the bidder shall be submitted by e-mail to the following address: rss.procurement@rss.jo. Once answered, they will be circulated among all bidders who wish to submit their proposals. The deadline of the questions and the answers is shown in general conditions & requirements. No question will be considered after the mentioned date.

5. Offer Template:
   - The technical and financial Offers shall be submitted in separate pdf files (***one separate pdf file for technical & another separate pdf file for financial)*** to the following Email: rss.procurement@rss.jo . **Any offer that includes both technical and financial offers in one pdf file will be rejected**.
   - Both of the technical and financial offers submitted by the bidders shall have the following font formats:
     - All the paragraphs shall be Calibri (body) with size of 12.
     - The head points shall be Calibri (body) with size of 16 and bold.
     - The subhead points shall be Calibri (body) with size of 14 and bold.

Technical Offer Template:

The technical offer shall be structured and presented in English language, as well as strictly complying with the following **sequence**:

➢ Section 1: Company Qualifications & Project plans

3.1. Cover Page

Including the project name and tender number.

3.2. Cover Letter

The cover letter must be signed by the person(s) authorized to submit the proposal and must delineate the company's ability to fulfill the project.

3.3. Company profile and team qualifications

A brief description of the Company profile, working team qualifications, all key personnel resumes and all required certificates shall be filled in the required tables in **Annex A.1** and to be included in this section.

3.4. Approach and Methodology (Project Work plan/ timeline)

The bidder shall provide a detailed work plan and timeline that **shall not exceeds 45 Calendar days** where extra marks in the technical evaluation for the shorter period.

The work plan shall specify, describe and explain each task for **all components of the project**, including the following:

a. Procurement, installation and operation.
b. Testing and commissioning Plan: the bidder shall include a commissioning and testing plan according to IEC -62446-1 and other related standards, listing all equipment and instruments that will be used in the commissioning.
c. Maintenance Plan:
   - A detailed maintenance plan, including a maintenance checklist and the contractor's commitment of technical support & response time of problem solving over the free maintenance period.

**** Note:** *The bidder shall use the timeline in* ***Annex A.2*** *as a template and include it in this section. The project timeline shall include Permits, Procurement, installation, operation, testing and commissioning milestones* ***at least.***

d. QA/QC plan

The bidder shall propose a quality assurance as well as a quality control plans.

e. Safety plan

➢ Section 2: Photovoltaic Systems

3.1. Photovoltaic Systems; General Description

The bidder shall fill the compliance sheet in **Annex (A.3)** and include it in this section.

All bidders responding to this RFP shall propose an EPC technical and financial proposal of a suitable and full possible capacity of grid-connected PV solar system on the spaces described in this tender taking into account the facilities' roofs and building conditions, load patterns, in addition to the training of staff and maintenance of the system.

The Photovoltaic systems in this tender is one Off-Grid Photovoltaic systems with storage that has the ability to be connected to the utility grid. The system powers the sport facility in the municipality. System capacity is shown in the table below:

System Name	Photovoltaic system size (kWp)	Battery System Size (kWh)	AC Output Power (kW)
Sport Facility	5	10	5

Figure 1: The Sport Facility site layout

3.2. Photovoltaic Systems; Technical Specification

All Proposed designs & work shall be in full compliance with the applicable regulations

The bidder shall include a technical site description including the solar radiation on the site, site and installation criteria, boundaries, near and far shading obstacles, structural, civil and electrical assessment, and any relevant information.

3.2.1. Electrical PV System Design

- The technical offer shall include an Electrical PV System Design Description including at minimum:
    1. A simulation model for forecasting the energy output of the proposed design with a detailed simulation report.
    2. A detailed Single Line Diagram for the PV system
    3. Voltage drop and power loss calculations for all circuits and cables.
    4. An earthing design plan for all metallic parts.
- The Proposers shall consider in their electrical design the Industry Standards, the National Electric Code, IEEE 1547-2003 "IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems." and other applicable codes and standards.
- All proposed AC- electrical designs must comply with the Electrical distribution company requirements and IEC standards.
- The simulation software design and results shall take into account all shading patterns and shall include near and far shading analysis for the design.
- The bidder must take into consideration the following input parameters in the simulation software, and all values must be realistic and close to the field norms and standards:
    - Thermal loss factor
    - DC wiring losses (less than 2%)
    - AC wiring losses (less than 2%)
    - Transformer losses
    - LID losses

- Mismatch losses
- Soiling losses (according to the prosper cleaning plan)
- Shading factor table
- Shading limit angle

- The electrical design provided in the offer documents shall include the appropriate sizing of all cabling works and all protection equipment (above and below ground) that will connect the modules, strings, arrays, inverters, batteries and to the point of interconnection.
- All protection equipment throughout the system shall be sized and specified to reduce damage on all components and the interconnection point in case of an electrical failure (e.g., over voltage, under voltage, over current and intermittency protections).
- The Proposer shall include in the offer all the required sizing, cross-sectional areas and lengths of the DC and AC cables along with required conduits and trenches.
- The Proposer shall provide voltage drop and energy loss calculations for all PV and AC circuits to meet the allowed percentages as follows:
  - For PV/DC circuits: <2% voltage drop from the nominal voltages for all DC circuits.
  - For PV/DC circuits: <2% power loss from the STC DC capacity.
  - For AC circuits: <2% voltage drop from the nominal voltages for all AC circuits.
  - For AC circuits: <2% power loss from the rated AC capacity.

- Earthing system shall be provided for the earthing of the entire project including distribution boards, panel boards, electrical circuits, PV modules, mounting structure, inverters, building structure, and bonding…etc. and associated equipment.
- The DC and AC earthing systems must be separated according to the electrical distribution company regulations and requirements.
- The earthing system shall achieve a maximum total resistance of 5 Ω.

3.2.2. PV system Layout

- The technical offer shall include PV System Layout Drawings including 2D and 3D Layouts of the system. All details of the structure location and methodology of fixation.
- The 2D and 3D layouts of the system shall:
  - Consider service passages to enable the ease of maintenance and system cleaning.
  - Include the location of the PV modules, inverters, batteries and cable routes.

3.2.3. Civil Designs

- In Annex. (A.4), a preliminary civil design for the mounting structure that the contractor shall use for the detailed design.
- The technical offer shall include Civil PV System Design Description including the details of the structural metal elements for the PV mounting structure.
- The Proposer shall provide the following details for the structural metal elements for the PV mounting structure:
  - Manufacturer datasheet and mill certificate
  - Model number
  - Details of the metal to be used.

- Details of the method for fixing the structure of the PV system.
- The coating of the structure.
- Declaration of compliance with the structural design requirements mentioned in this RFP.

- The Proposer shall use array mounting hardware compatible with the site considerations and environment.
- The Contractor shall consider when awarded the contract that all civil studies and designs shall be reviewed and approved by a registered engineering office and a structural engineer (Certified Third Party) with a minimum experience of 10 years that shall be approved by the National Energy Research Center.
- The Proposer shall include a site plan indicating all civil requirements.

3.3. **Selected Components and Equipment**

The Proposer shall include at minimum but not limited to the following Selected Components and Equipment along with a description of their specifications. The datasheets, guarantees and warrantees shall also be attached:

- PV modules
- PV Mounting Structures
- Inverters / Chargers
- Batteries
- PV/DC and AC cables and conduits
- PV / AC Cables and Accessories
- Distribution Boxes

The awarded contractor must provide the warranties from the manufacturer. The proposer must attach international compliance/test certification for each component issued from a reputable party.

The Proposer shall include a detailed Bill of Quantities for all materials and equipment proposed.

3.4. Description of Works

The Proposer shall include a Description of the Works which will be provided throughout the project in details including all procurement, installation and operation tasks.

3.5. Testing and Commissioning Plan

The Proposer shall include in the technical offer a Testing and Commissioning Plan in compliance with the testing and commissioning technical requirements.

3.6. Maintenance and Cleaning Plan.

The Proposer shall include in the technical offer a Maintenance and Cleaning Plan for 2 years including the following:

- A detailed maintenance plan including a maintenance checklist and technical support.

- A detailed cleaning mechanism and plan for the PV system including the devices used for cleaning.
- The cleaning frequency per year.

3.7. System Components Specifications

3.2.4. PV Modules:

- The photovoltaic modules have to be based polycrystalline silicon technology, and they have to fulfil the following technical specifications and standards, which have to be certified by an official institute if applicable:
- The Photovoltaic modules shall be manufactured not before 2020.
- The Photovoltaic modules should be grade A.
- Cell Type: poly-crystalline
- The output power of the crystalline module should not be less than 335Wp at standard test condition. (STC).
- Module Efficiency shall be at least 17%.
- Operating PV temperature ranges between -10 °C & + 85 °C.
- Modules temperature sensitivity at peak power should not exceed -0.40%/°C.
- Module's weight should not exceed 26 kg.
- The PV modules frame should be made from Anodized Aluminium.
- The PV modules maximum system voltage should not be less than 1,500 V.
- The PV modules should be PID resistant.
- The PV modules should have a positive power tolerance.
- The PV modules shall have individual serial numbers behind each front glass and on the back side of the module.
- Electrical connection shall be on a robust terminal block in an IP65 junction box or higher.
- The warranty for module defects after installation should be at least 10 years.
- The awarded Proposer shall provide a manufacture power guarantee for all PV modules that will be installed with their serial numbers that guarantees that the loss of the output is not more than 10% during the first 10 years and up to 20% in total after 25 years. The warranty must state that the malfunctioning solar photovoltaic module must be exchanged by the manufacturer. The replacement solar module must be identical to, or an improvement upon, the original design of the malfunctioning solar module.
- Mechanical stability – IEC 61215: Design qualification and type approval for crystalline silicon terrestrial photovoltaic (PV) modules.
- PV module safety qualification standard: IEC/EN 61730 for safety class II test.
- Along with TUV, CE compliant and UL certification, salt mist/ammonia resistance should be provided.
- Mechanical load tests up to 5400 Pa, Damp Heat, Thermo Cycle and Humidity and Freeze tests.

3.2.5.PV Mounting Structures

The modules have to be mounted on metallic sub constructions of suitable height from the ground and with the necessary declination in relation to the horizontal plane, so as to gain the maximum of solar radiation and energy production.

- The supporting structure has to be compatible with the offered photovoltaic modules and should be made of **painted steel**.
- The coating layer of the painted steel must have minimum of three layers of coating (Prime coat, intermediate coat and finish coat) in order to withstand expected weather conditions for at least 10 years.

In detail, the minimum specifications of the mounting structure are:

- The minimum wind speed of 150 km/h shall be considered for the mounting structure design (shall be proved with test certificate by authorized party).
- All bolts, nuts, and washers for the PV modules' mounting structure must be made of stainless steel.
- The PV modules shall be fixed to the structure using clamps where all clamps in contact with the PV modules' aluminium frames must be made of aluminium.
- The PV modules' aluminium frame must not directly contact any dissimilar metal where spacers shall be used if needed
- A detailed structural analysis shall be submitted taking into account the Lebanese Loads Code and each area specific conditions (additional safety factor).
- Anti-corrosion guarantee from the weather conditions.
- Manufacturer's warranty should be at least 10 years.

3.2.6.Batteries

- The bidder has the right to provide AC coupled battery system or DC coupled battery system.
- Battery technology shall be Lithium-ion, while the chemistry shall be NMC (manganese cobalt oxide)
- Battery should have one mean of thermal management system (either passive or active)
- Battery should include a BMS (Battery management system) with communication
- Battery should be enclosed in a Nema 1 case rating or higher
- Battery should have extra safety precautions to stop thermal runaway in case it happens
- Battery warranty of at least 5 years.
- The batteries shall be installed in a cooled environment (Cooled room or cooled cabinet).
- The batteries shall be installed in a fan cooled outdoor Cabinet with IP67.

3.2.7.Inverters/Chargers

- The power electronic system shall have the ability to be connected to the grid and to feed in the grid in addition to the ability to operate as standalone system in case of the absence of the utility grid.
- The AC power of the inverter must synchronize automatically with the AC voltage and frequency of the grid (3-phase or 1-phase depending on each PV system requirements) within the tolerance range specified according to **SOLAR PV GRID INTERCONNECTION CODE FOR LEBANON**.
- The inverter(s) shall comply with the Electrical distribution company regulations and standards.
- The Inverter/Charger should be designed to operate the PV array near its Maximum Power Point (MPP).
- The Inverter shall be provided with integrated DC switch.
- The Inverter shall be provided with an LCD display to provide instantaneous information about the subsystems and system output data and performance.
- Temperature operating range: -20 ºC to 60 ºC
- Harmonic distortion is less than 3%.
- Protection degree is IP65 or higher (outdoor).
- TUV and CE compliant.
- Warranty after installation should be for 5 years at least for the inverters. The warranty must state that the malfunctioning inverter must be exchanged by the manufacturer. The replacement inverter must be identical to, or an improvement upon, the original design of the malfunctioning inverter.
- The inverter must be cooled using natural ventilation if installed outdoors.
- The inverter must be installed separately from the PV mounting structure and must be protected from direct sun light and rain (weather conditions) if the inverter is installed outdoors.
- The inverter installation location must be adequately ventilated if the inverter is installed indoors.
- The inverter must be properly fenced if installed in an exposed location.
- The inverter shall have surge protection SDP on the DC and AC side. If the inverter does not support integrated SPD protection a separate external SDP must be installed.

3.2.8.PV / AC Cables and Accessories

The minimum specifications of the PV and AC cables are:

- PV cables shall comply with TUV standards.
- Operation temperature for PV cables should be up to +80ºC
- PV cables shall be UV resistant, flame retardant, and with low smoke characteristics.

- PV and AC cables shall comply with local and international standards and the DISCO's requirement.
- AC cables shall be insulated, (armoured is a plus), sheathed **copper** cables drawn from the PV yard up to the connection points and shall be rated at minimum of 600Vac.
- All external cables must be installed inside an external use or hot dipped galvanized cable tray with minimum thickness of 1.5 mm and minimum galvanization thickness of 30µm.
- PVC Flexible pipes with glands shall be used between the modules and the cable tray.
- The cable ties shall be UV resistance.
- All cables laying in trenches must be separated by cable spacers.
- All cables shall be marked properly by means of good quality labels or by other means so that cable can be easily identified.
- All cables shall be marked in compliance with IEC 60446-3 category C Basic and safety principles for man-machine interface, marking and identification.
- Factory warranty shall be not less than 5 years.
- Reference codes and standards for cables:
  - IEC 60189-2 Low-frequency cables and wires with PVC insulation and PVC sheath – Part 2: Cables in pairs, triples, quads and quintuples for inside installations.
  - IEC 60228 Conductors of insulated cables.
  - IEC 60502-1 Power cables with extruded insulation and their accessories – Part 1: Cables for rated voltages of 1 kV ((Um = 1, 2 kV) and 3 kV (Um = 3, 6 kV).
  - IEC 60502-2 specifies the construction, dimensions and test requirements of power cables with extruded solid insulation from 6 kV (Um=7.2kV) up to 30 kV (Um=36kV) for fixed installations such as distribution networks
  - Reference codes and standards for cable testing:
  - IEC 60885 Electrical test methods for electric cables
  - IEC 60332 Tests on electric and optical fibre cables under fire conditions

3.2.9.AC Distribution Boards

- The Distribution Boxes shall be made of hot coated or galvanized steel; dust and vermin proof with a protection degree IP66 at least.
- The distribution board shall house the PV energy meter.
- The terminals and bus bars shall be made of tin coated copper and appropriately sized; the boxes shall have suitable cable entry with suitable glands arrangement for both input and output cables.
- Suitable markings on the bus bars shall be provided to identify the bus bars.
- The distribution box shall be grounded and for this purpose a suitable ground terminal is to be arranged.
- The distribution boards shall be completely factory assembled, pre-wired, and tested.

- The distribution boards shall be designed to meet the requirements of applicable parts of the following Standard's last edition:
  - IEC 60038 IEC Standard Voltages
  - IEC 60044-1 Instrument Transformers - Part 1: Current Transformers
  - IEC 60044-2 Instrument Transformers - Part 2: Inductive Voltage Transformers
  - IEC 60051 Direct acting indicating analogue electrical measuring instruments and their accessories
  - IEC 60068 Environmental testing
  - IEC 60071 Insulation Coordination
  - IEC 60073 Basic and safety principles for man-machine interface, marking and identification - Coding principles for indication devices and actuators
  - IEC 60085 Electrical Insulation - Thermal Evaluation and Designation
  - IEC 60255 Electrical Relays
  - IEC 60269 Low Voltage Fuses
  - IEC 60445 Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors
  - IEC 60529 Degrees of protection provided by enclosures (IP Code)
  - IEC 60865 Short-circuit currents - Calculation of effects
  - IEC 60934 Circuit-breakers for equipment
  - IEC 61000 Electromagnetic compatibility (EMC)
  - IEC 61140 Protection against electric shock - Common aspects for installation and equipment.
  - IEC 60664 Insulation Coordination with Low-voltage Systems including clearances and Creepage Distances for Equipment.
  - IEC 61008-1 Residual Current operated circuit Breakers without integral overcurrent protection.

3.2.10. Labelling

- Each item of equipment must have nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place.
- Tags for each power cable or wire located in manholes, hand holes, and vaults shall be provided.
- Warning labels shall be provided and affixed in a conspicuous place.
- All labelling material shall be weather-resistant.

3.8. Engineering Works

- The Contractor shall provide structural design of the structural steel elements as per the following requirements:
  - Include a simulation model shall be provided for showing all nodes and elements with detailed loads and reactions calculations.
  - Be in accordance with the AISC-306: Steel construction manual.
  - Consider that if secondary members' or rails' material is different from the PV module material, then a separator shall be used to prevent corrosion.
  - Include seismic and snow load design calculations for the mounting system and its attachments showing compliance to the requirements of the National Building

Code (Loads and forces). The mounting structure of PV shall withstand a wind speed of **150 km/hour**, relative humidity of 100% and a temperature of 60 ^{0}C.

- Include designs for all elements of the hardware required for mounting the PV system and assembling the PV modules and the attachments to the mounting structure.
- The contractor shall provide Structural steel and footing analysis using STAAD.pro or/and any equivalent program.

- The awarded Proposer shall submit within 14 days of official awarding date a working program showing the planned duration for project implementation phases.
- The contractor shall get consent from the Municipality of the equipment to be installed before doing purchase order.
- The contractor shall notify the Municipality the date of the on-site delivery of the components so they can verify the compliance with RFP requirements.

3.9. **Construction Works**

- The Contractor shall respect the site safety, security and general regulations and to be highly cooperative with the Municipality staff.
- The Contractor shall apply Lebanese "labour law" that includes the use of underage labour, non-resident or unlicensed labourers.
- All permits and approvals required to execute the work are the responsibility of the Contractor, The Contractor shall provide copies of all approved permits and applications for permits still in process on the effective date of the contract.
- The contractor is responsible for all fees required for obtaining all approvals and permits required for the project.
- It is the Contractor's responsibility to execute the work and identify the required permits at his own expenses. All permits shall be provided as hard and soft copies.

Financial Offer Template:

The financial offer shall be structured and presented in English language with the same sequence as follows:

Cover Page

The financial offer for the photovoltaic system should be covered by the special cover page in **Annex (B.1)**.

➢ Photovoltaic System Cost Breakdown

- The bidder shall fill in all required data in Annex (B.2) and include it in this section.
- The proposal must submit a detailed BOQ with each item type, model number, origin, quantity, unit cost and total cost. With a minimum BOQ items as per Annex (B.2).
- The financial offer shall include the training, maintenance and cleaning cost.

- The financial offer shall include the civil and electrical tests cost.
- The financial offer shall include the civil studies and verification cost.
- All prices should be clear and expressed in US Dollar (USD) including VAT (if applicable), customs, taxes and any transportation/delivery costs to the project location.
- The Proposer shall price all proposed items and if any key item is not priced; then it will be implicitly considered.