



Norwegian Ministry
of Foreign Affairs



**Construction of Solar Energy System
For
Khan Younis Waste Water Treatment
Plant
(KY WWTP)**

Tender Documents
Operation and Maintenance (O&M) SERVICES

Executing Entity: UNDP
Employer:

January 2021

Consultant





A. Scope of Works

As part of the Scope of Works and on the contractor's expense, the Contractor shall carry out the Operation and Maintenance (O&M) services for the solar energy system and all related works for the period of two months shall carry out the maintenance for the next period as indicated in the contract.

The O&M services shall include the following:

- PV System monitoring
- Scheduled Maintenance
- Unscheduled Maintenance
- Management of Spare Parts
- Monthly O&M Reports

B. O&M SERVICES

1. Commencement, Duration and Delay

- 1.1 The Contractor shall operate and maintain the solar energy system and provide the O&M Services commencing on the Services Commencement Date until the earlier of:
1. Termination of this Contract pursuant to this Contract; or
 2. After two months of issuance of the project handover certificate.
- 1.2 The Contractor shall be entitled to a reasonable extension of time determined by the Employer without additional cost in the event that the O&M Services are delayed by an Event or an act of prevention by the Employer.

2. Data

- 2.1 The Contractor shall provide the Employer with:
1. Data in relation to any monitoring platforms used by the Contractor on a monthly basis as part of the O&M Report; and
 2. An O&M Report on a monthly basis on the 10th day of each month in respect of the preceding month; and
 3. All other relevant information and data (and in the frequency) as required by the Employer.

3. Access

- 3.1 The Employer shall give to the Contractor access to the solar energy system to enable the Contractor to carry out and complete the O&M Services in accordance with this Contract.

4. Contractor's General Obligations

- 4.1 The Contractor shall:
1. Exercise all reasonable skill, care and diligence (and in accordance with Good Industry Practice) in the performance of its obligations under this Contract and in accordance with the Laws, until the issuance of the Handover Certificate;



2. Subject to **clause 4.1-1**, carry out and complete the O&M Services in accordance with this Contract, in a good workmanlike manner and in accordance with all relevant manuals;
 3. Comply with any reasonable instructions issued to it by the Employer in relation to the O&M Services;
 4. Be responsible for the provision of the following for performance of the O&M Services:
 - 4.1 The availability of qualified and experienced personnel;
 - 4.2 Supervision, labor, materials and any Contractor's equipment required;
 - 4.3 Depot in order to hold sufficient stock of spare parts in order to enable the Contractor to perform the O&M Services required under this Contract for which the Contractor is responsible;
 - 4.4 Maintaining the minimum stock of essential spare parts required in order to perform the O&M Services; and
 - 4.5 Supplying and transport of Spare Parts;
 5. Provide administrative support as required by the Employer in connection with the O&M Services and any technical assistance as may reasonably be required by the Employer; and
 6. Procure that its representatives are informed of and comply with all written Property specific safety and security regulations in force at the Property which are notified in writing to the Contractor by either the Employer or the relevant Tenant.
- 4.2 The Contractor warrants to the Employer that:
1. Materials shall be free from all security interests, liens or other encumbrances;
 2. Materials shall be new and of good quality; and;
 3. The Contractor has not used or permitted to be used or specified and will not use or specify for use or permit to be used;
 4. The Contractor is not aware and has no reason to suspect or believe that there have been or will be used; and
 5. The Contractor will promptly notify the Employer in writing if he becomes aware or has reason to suspect or believe that there have been or will be used, in or in connection with the Services, any materials or substances other than in conformity with the relevant international standards and codes of practice, as specified in this Contract.
5. Defects
- 5.1 The Contractor shall be responsible for any defect which appears in the Solar Energy system and all related works (save to the extent they fall under the Contractor's obligations under the Defects Notification Period) which:
1. Is due to the Contractor's failure to comply with the terms of this Contract; and
 2. Appears in any Spare Part provided under this Contract within 24 months from the date of installation.
- 5.2 In the event that a defect appears in a Spare Part, the Contractor shall be required to remedy such defect as required by the Employer.



6. Scheduled Maintenance

- 6.1 The Contractor shall carry out Scheduled Maintenance in accordance with the Programme of Maintenance at the timescales set out therein. The Contractor shall carry out such Scheduled Maintenance within a time period of up to fifteen (15) Working Days before or fifteen (15) Working Days after the relevant date provided for in the Programme of Maintenance or within such other time period as may be agreed between the Parties.
- 6.2 Scheduled Maintenance shall (where applicable) include the procurement and supply of all the Contractor's equipment, labour, travel and accommodation of the Contractor's personnel and subcontractors who are engaged in the provision of the O&M Services from time to time.
- 6.3 The Contractor shall be entitled to issue an updated Programme of Maintenance to take into account any delays caused to the Contractor which are not attributable to the Contractor in relation to which the Employer has granted an extension of time pursuant to **clause 1.2**.
- 6.4 The Contractor shall carry out the O&M Services in accordance with the service levels set out in Programme of Maintenance Schedule. The Contractor will be required to report in the O&M Report on the achievement of the service levels. If the Contractor fails to meet the service levels set out in Programme of Maintenance Schedule, the Contractor shall immediately but in any event within three (3) days investigate the underlying causes of such failure and notify the Employer of the planned corrective action as soon as possible.
- 6.5 If the Employer is not satisfied with the planned corrective action proposed by the Contractor, it may request modification or instruct the Contractor to make changes to the planned corrective action. The Contractor shall comply with all such instructions of the Employer and the Employer has the right to call on the O&M Bond if the Contractor fails to carry out the planned corrective action as proposed or amended by the Employer, and achieve the service levels.

7. Unscheduled Maintenance

- 7.1 In order to support and safeguard the operation of the PV System, the Contractor shall perform any necessary Unscheduled Maintenance in accordance with the Contract.
- 7.2 The Contractor shall perform any Unscheduled Maintenance as soon as is reasonably practicable (taking into account the nature of the Unscheduled Maintenance required) upon identification of the need for Unscheduled Maintenance by the Contractor (whether by remote notification or otherwise) or pursuant to the provisions of the following **clauses 7.3 to 7.6**.
- 7.3 For the duration of this Contract, the Contractor shall be required to operate an incident call facility between the hours of **8:00am** and **3:00pm** on Working Days for the notification of any matter which may require maintenance of the Solar Energy System and provision of the O&M Services by the Contractor including but not limited to Unscheduled Maintenance and/or defect rectification pursuant to clauses 5.1 and 5.1. The Contractor shall provide a manned emergency telephone facility for the reporting of emergencies outside of the hours of 8:00am and 3:00pm GST and non-Working Days.
- 7.4 If, in case of emergency services and/or activities likely to cause damage to property or persons, where the Contractor does not start said services and/or activities within 24 hours from the receipt of the Employer's or Tenant's notification, the Employer shall be entitled to arrange for the execution of such O&M Services by third parties and claim the cost from the Contractor.



- 7.5 The Contractor shall undertake any Unscheduled Maintenance and use its reasonable endeavours to carry out an investigation of the Property within seventy-two (72) hours of notification and shall complete the Unscheduled Maintenance within seven (7) Working Days of notification.
- 7.6 The Contractor shall retain records of all calls received and details of the complaints made and shall upon request and on a monthly basis provide such information to the Employer.

8. Spare Parts

- 8.1 The Contractor warrants to the Employer that:
1. the Contractor has carried out a comprehensive review of all the Spare Parts requirements from a supply and logistical perspective including but not limited to reviewing the availability of suppliers, supplies, lead times and risks associated with importing goods into Gaza and as such will not be entitled to any relief for any failure to make Spare Parts available for the O&M Services.
 2. As at the Services Commencement Date, the existing Spare Parts Stock has been inspected by the Contractor and that the quality, quantity and condition of the existing Spare Parts Stock comply with the standards for the performance of the O&M Services.
- 8.2 The Contractor shall regularly review the Spare Parts Stock to ensure that it is compliant with the standards for the performance of the O&M Services in accordance with Good Industry Practice.
- 8.3 The Contractor shall:
1. store and maintain the Spare Parts Stock for the benefit of the Employer and provide appropriate and safe, secure and adequate storage for the same provided that if the Contractor needs to replace any Spare Parts used from the Spare Parts Stock pursuant to this Contract the Contractor may, in its discretion, elect to utilize the relevant spare parts from the Contractor's overall inventory of spare parts provided they comply with the requirements of this Contract and provided that the Contractor shall prioritise the use of Spare Parts Stock;
 2. Maintain an up to date list of the Spare Parts Stock and provide the Employer with a copy of such list within ten (10) Working Days of any request by the Employer;
 3. Install Spare Parts in accordance with the terms, conditions and requirements of the Contract;
 4. Replace all Spare Parts used from the Spare Parts Stock promptly at the Contractor's cost and risk so as to maintain the Spare Parts Stock at all times;
 5. Ensure that all Spare Parts procured or provided by the Contractor shall be:
 - 5.1 New (save where the Employer consents in writing to the procurement of refurbished Spare Parts which carry an acceptable two (2) year warranty from the relevant manufacturer or supplier) and fit for purpose;
 - 5.2 of the same brand and quality to the parts being replenished. If the Contractor is unable to procure or provide the Spare Parts of the same brand and quality to the parts being replenished, it may procure or provide Spare Parts of a different brand or better quality provided that it obtains the Employer's prior written approval;
 - 5.3 provided with manufacturer warranty periods and terms of equal or better periods and terms than in relation to that Spare Part being replaced;
 - 5.4 of equal or better specification/functionality than those being replaced;



5.5 in accordance with the specifications and recommendations contained in Programme of Maintenance Schedule to the Contract; and adequately insured from their country of origin to the Site.

6. Manage and replenish the Spare Parts Stock so that Spare Parts can be provided without delay when required, including ensuring that there are at all times an adequate stock of Spare Parts which shall be capable of being installed in the PV System within the timescales outlined in the Contract; and

7. Use all reasonable endeavours to procure that its suppliers co-operate with the Employer to enable the Employer to track the procurement of Spare Parts.

8.4 The Contractor shall not take any Spare Parts from the Spare Parts Stock and use them for any other purpose other than the O&M Services without the Employer's prior written consent.

8.5 Title to the Spare Parts Stock shall at all times remain with the Employer. Risk of loss and damage to the Spare Parts shall be borne by the Contractor until the Spare Parts are installed in the Solar Energy System (and if they are removed from the PV System for any reason until they are replaced). The Contractor shall replace or make good as applicable, at its cost, all loss and damage to the Spare Parts from any cause arising during the period that the Contractor bears such risk unless the Employer, the Employer or its Affiliates cause such loss or damage.

8.6 The Contractor shall provide the Employer with all information reasonably requested by the Employer from time to time, and at a minimum on a quarterly basis, relating to the number condition, and usage of the Spare Parts Stock.

9. Suspension

9.1 The Employer, acting reasonably, may at any time instruct the Contractor to suspend progress of part or all of the O&M Services.

9.2 Immediately on receipt of an instruction under clause 9.1, the Contractor shall make all necessary arrangements to minimise his expenditure and cease carrying out the O&M Services or such part of the O&M Services as have been suspended.

9.3 The Contractor shall not be entitled to be paid any additional costs if such suspension is necessary by reason of an act, omission, default or neglect on the part of the Contractor.

9.4 The Contractor shall not be entitled to additional costs for any suspension of the O&M Services.

10. O&M Handover

10.1 Within thirty (30) days of the expiry of the Term, the Contractor shall comply with the Handover Requirements and notify the Employer in writing once it considers that the Handover Requirements have been complied with.

10.2 Upon receipt of the Contractor's written notice in clause 10.1, the Employer shall determine whether the Handover Requirements have been satisfied by the Contractor. If the Employer determines that the Handover Requirements have been satisfied by the Contractor, it shall issue the Handover Certificate.

10.3 If the Employer determines that the Handover Requirements have not been satisfied by the Contractor, the Employer shall provide a written notice to the Contractor notifying it of the same and outlining its reasons as to why the Employer has determined that the Contractor has not satisfied the



Handover Requirements. Within fourteen (14) days of receipt of such notice from the Employer, the Contractor shall satisfy the Handover Requirements to the satisfaction of the Employer.

- 10.4 Notwithstanding anything set out in this Contract, if the Contractor fails to comply with the Handover Requirements in accordance with **clause 10.3**, the Employer may do any one or more of the following:
1. Liquidate the O&M Bond; or
 2. carry out (or procure another third party to carry out) any of the works or services required to satisfy the Handover Requirements upon the contractor's expenses.
- 10.5 If the Employer exercises its rights under **clause 10.4-2**, the Contractor acknowledges and agrees that the Contractor shall be liable to the Employer in relation to any costs incurred by the Employer in exercising such rights and such costs shall be a debt due and payable by the Contractor to the Employer.
- 10.6 The provisions of **clauses 10.1 to 10.5** shall survive termination or expiry for whatever reason of the Contract and be without limit in point of time.

11. Performance Warranty

- 11.1 From the issuance of the project handover certificate until the earlier of, the issuance of the O&M Handover Certificate or the date of termination of this Contract, the Contractor warrants that the Measured Availability of the Solar Energy System will achieve, the Guaranteed Availability.
- 11.2 From the issuance of the project handover certificate until the earlier of, the issuance of the O&M Handover Certificate and the date of termination of this Contract if the Guaranteed Availability is not achieved, the Contractor shall pay to the Employer Performance Damages.
- 11.3 Any Performance Damages for which the Contractor may become liable under this clause shall not **exceed fifteen percent (15%) of the Contract Price**, are agreed as a genuine pre-estimate of the losses which may be sustained by the Employer. In circumstances where the level of any Performance Damages payable pursuant to clause 11.2 are successfully challenged (or otherwise deemed in any judicial proceedings) as constituting a penalty or otherwise cannot be enforced against the Contractor, the Employer shall be entitled to recover all actual damages suffered by the Employer as a result of the Contractor's failure.



C. Programme of Maintenance Schedule

Operation Maintenance Schedule for KYWWTP 1.3 MW Solar Plant								
System Component	Maintenance Action	As Needed	Frequency					
			Daily	Weekly	Monthly	Quarterly	Semiannually	Annually
PV System Site	Verify Cleanliness (accumulation of debris around and/or under array)				✓			
	Verify Shading availability & risk of shading				✓	✓		
	General Site Conditions				✓	✓		
PV Modules	PV Modules cleaning				✓			
	Verify Cleanliness (accumulation of dust or fungus on array).			✓				
	Unscheduled cleaning due to dust and dirt	✓			✓			
	Visual check for defects (Fractures, Browning, Moisture Penetration, ...)				✓	✓		
	Visual inspection of Modules cable connections				✓			
	Visual check of Junction Boxes/string combiner boxes for water ingress, dirt, dust accumulation				✓	✓		
	Conduct Thermography for Hotspots), only if a thermographic camera is allowed into Gaza)				✓			
	Check Modules glass for broken parts				✓			
	Check modules connections integrity				✓			
	Animal or pest activity under array			✓				
	Periodic insulation resistance testing				✓			
	Vegetation management – cutting, removing, control	✓			✓			
Inverters	Visual inspection of the state of running of the inverter.				✓			
	Check mounting bolts for corrosion.							
	Check for dust or moisture penetration.				✓			
	Cleaning of dust and ventilation grill.				✓	✓		



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System Component	Maintenance Action	As Needed	Frequency					
			Daily	Weekly	Monthly	Quarterly	Semiannually	Annually
	Cleaning of ventilation plate.				✓			
	Analyzing the temperature indicators.				✓			
	Check Voltage & current measurements		✓	✓	✓			
	Compare voltage and current measurement with inverter readings		✓	✓	✓			
Mounting Structure	Verify tightness, integrity & treatment of bolts and other fastening devices				✓			
	Inspection for Corrosion & treatment				✓			
	Thorough Mounting Structure Health check				✓			
Lightning Protection System	Rod-PULSAR connection				✓			
	Cable-PULSAR connection				✓			
	Cable-electrode connections				✓			
	Connectivity between electrode and PULSAR				✓			
	General Lightning Protection system check	✓			✓			
Wiring Installation	Verify Mechanical Integrity of Conduits.				✓			
	Verify Insulation Integrity of Cables installed without conduit				✓			
	Check Junction Boxes for Tightness of Connections,				✓			
	Water accumulation/build up				✓			
	Integrity of Lid Seals				✓			
	Integrity of Cable Entrance and/or Conduit sealing				✓			
	Integrity of Clamping devices				✓			
	Verify Blocking Diodes				✓			



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System Component	Maintenance Action	As Needed	Frequency					
			Daily	Weekly	Monthly	Quarterly	Semiannually	Annually
	Surge Arresters for Degradation.				✓			
Electrical Characteristics	Measure Open Circuit Voltages				✓			
	Measure Short Circuit Currents				✓			
Earthing	Check Earthing Connections for Tightness of Connections & Corrosion				✓			
	Continuity				✓			
	Resistance				✓			
Protective Devices	Verify: Integrity of Fuses, breaker, and residual current devices				✓			
	Verify: Operation of CB's and RCD's				✓			
	Verify: Operation of Solar Array Isolation Device				✓			
	Verify: Operation of Earth Fault Protection System				✓			
	AC&DC combiner boxes check				✓			
Other Balance of System	Monitoring System				✓			
	Auxiliary Power Supplies				✓			
	Communication Systems, including signal strength and connection	✓			✓			
PV System as a whole	Condition inspection of whole PV system				✓			



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Operation Maintenance Schedule for KYWWTP 1.3 MW Solar Plant								
System Component	Maintenance Action	As Needed	Frequency					
			Daily	Weekly	Monthly	Quarterly	Semiannually	Annually
Unscheduled Maintenance	tightening of loose cables	✓			✓			
	Replacement of blown fuses	✓			✓			
	repairing lightning damages	✓			✓			
	repair of equipment damaged	✓			✓			
	rectifying SCADA faults	✓			✓			
	Repair of mounting structure faults	✓			✓			
	Module Replacement	✓			✓			
	Inverter Replacement	✓			✓			
Spare parts Inventory	Mounting Structure pieces				✓			
	Junction/combiner boxes				✓			
	Fuses				✓			
	DC/AC cabling components				✓			
	Communication Equipment				✓			
	Modules				✓			
	Inverters				✓			



D. O&M Report Format

The O&M Report shall contain at least the following:

1. Executive Summary.
2. Performance summary including classified, recorded tabulated summaries of data logged and recorded, in the case of PV System availability and Performance Ratio levels consistent with the definitions of the agreement, and compared against guaranteed values
3. Key summaries of significant performance data will be included in the monthly reports
4. Maintenance summary listing all maintenance activities that occurred during the month including materials used and outcome.
5. Spare Parts summary, including items used, items remaining, comparison of inventory to recommended stocking levels and replacement schedule for any items consumed.
6. Power factor and reactive power operational statement.
7. Technical issues arising.
8. Health, safety & environmental issues.
9. Claims made under the Employer's guarantees/warranties.
10. Such other information as is required by Applicable laws.
11. Contact information for Contractor management.
12. Any other material issues affecting the performance or operation of the Plant.
13. Failures identification times.
14. Repair times following failure identification.



E. TRAINING

The Contractor shall plan, manage and conduct a training programme for end user's Personnel. Such personnel will be capable of being trained in the specific requirements of the security system. All training activities and materials shall be conducted/ prepared in Arabic and English language.

The Contractor shall conduct a single training programme for up to five (5) personnel designated by the end user, including local surveillance. The training shall be conducted on three (3) days and in line with the terms prescribed in the Contract.

Training topics shall include:

1. Site Personnel Safety
2. Emergency Inverter Shut Down Procedure
3. Inverter Start Up Procedure
4. O&M Manual Detailed Review
5. Review Site Maintenance Plan
6. Detailed Review of As-Built Drawings
7. Cleaning/washing process of module surface (in case of unexpected dirt)
8. SCADA system operation
9. Deactivation and re-activation of alarm system and single parts of it
10. Use of entrance key
11. Failure detection and prevention
12. Walking tour of security system
13. Exemplary release of alarm and action required.
14. A detailed training program shall be provided by the Contractor to the Employer as part of the documentation to be supplied for Taking Over. The program remains subject to Employer's approval which shall not be unreasonably withheld.