



KCAA/CONF/1010/3/VOL.61 (187)

5th June 2026

TO ALL INTERESTED BIDDERS

ADDENDUM AND THE FIRST AND FINAL CLARIFICATIONS OF THE TENDER FOR THE SUPPLY, DELIVERY, INSTALLATION, TRAINING, TESTING AND COMMISSIONING OF PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT (SOLAR POWER SUPPLY SYSTEMS FOR MWAKIRUNGE, NGONG AND MANDERA AND MAINTENANCE OF DIANI MOBILE AIR TRAFFIC CONTROL TOWER) – LOT 1, 2 AND 3; TENDER NUMBER KCAA/031/2025-2026.

Reference is made to the above tender advertised by Kenya Civil Aviation Authority (KCAA) on Tuesday 19th May 2026 which you have expressed interest to participate. Reference is also made to the pre-bid meeting held on 3rd June 2026 at KCAA headquarters in Aviation House.

The Authority has received various requests for clarification on the above stated tender from interested candidates.

In accordance with the provisions of Instructions To Tenderers (ITT) section 9 and 10 and the Tender Datasheet ITT 8.2 of the tender document which was issued or obtained from KCAA website, the Authority has prepared an addendum and the first set of response to various requests for clarification received and as stated in the tender document. The preparation of the addendum and the first set of response to the request for clarifications has been necessitated by the request for clarifications sought by some of the bidders.

Attached herein is the addendum with the revised technical specifications and the responses to the clarifications requested.

Please note that this addendum and the clarifications shall be read and construed as part of the bidding document issued to you earlier.

The deadline for requesting additional clarifications is **5th June 2026** at 17:00 Hours.

The deadline for tender closing / submission is **12th June 2026** at **11:00 Hours, East African Time.**

We wish you the best as you prepare to submit your bids.

A handwritten signature in blue ink, appearing to read 'W Kitum', is written over a white circular stamp.

William Kitum
FOR: DIRECTOR GENERAL
Encl.





FIRST RESPONSE TO THE CLARIFICATIONS SOUGHT BY INTERESTED BIDDERS VIA EMAIL AND DURING A MANDATORY PRE-BID MEETING FOR SUPPLY, DELIVERY, INSTALLATION, TRAINING, TESTING AND COMMISSIONING OF PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT (SOLAR POWER SUPPLY SYSTEMS FOR MWAKIRUNGE, NGONG AND MANDERA AND MAINTENANCE OF DIANI MOBILE AIR TRAFFIC CONTROL TOWER) HELD ON 5TH JUNE 2026 AT DIANI AIRPORT. (RE-TENDERING) TENDER NUMBER KCAA/031/2025-2026

NO	REQUEST FOR CLARIFICATIONS FROM BIDDERS FOR LOT 1, 2, & 3	KCAA RESPONSES
FLIGHT CALIBRATION DRONE SYSTEM		
1.	Clarification on the tender title.	KCAA Team clarified that the tender is for the supply, delivery, installation, training, testing and commissioning of pre-flight calibration drone system and related equipment (solar power supply systems for Mwakirunge, Ngong and Mandera and maintenance of Diani Mobile Air Traffic Control Tower)
2.	Mandatory requirements	KCAA highlighted and explained individual listing requirements under mandatory criteria requirements.
3.	What about a joint venture arrangement under mandatory requirements?	A JV must be demonstrated and joint venture agreements signed.
4.	How about manufacturers authorization certificate?	Bidders must be able to provide evidence of manufacturers authorization
5.	What's the warranty status.	Warranty period for the drone system is three (3) years
6.	Post warranty	<ul style="list-style-type: none"> • Vendor to give a proposal on post warranty agreement that shall include paid service and extended support options after the initial warranty period. • Vendor to give a draft post warranty proposal during bidding • The Supplier shall guarantee availability of spare parts, consumables, and payload components for a minimum of ten (10) years from final acceptance.

**For Director General
Kenya Civil Aviation Authority
P.O. Box 30163 - 00100,
Nairobi**

Faint mirrored text and a blue signature stamp are visible at the bottom right of the page.

FIRST RESPONSE TO THE CLARIFICATIONS SOUGHT BY INTERESTED BIDDERS VIA EMAIL AND DURING A - MANDATORY PRE-BID MEETING FOR PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT (RE-TENDERING) - TENDER NUMBER KCAA/031/2025-2026.

NO	REQUEST FOR CLARIFICATIONS FROM BIDDERS FOR LOT 1, 2, & 3	KCAA RESPONSES
7.	Maintenance cost	The maintenance cost should be provided but not included in the form of tender, however KCAA will consider that during evaluation process.
8.	Will there be site surveys for LOT 3 for Diani?	The meeting agreed that a non-mandatory site survey for LOT 3 will be done at Diani Airport on Friday, 5th June, 2026 at 1100 hours. Further clarifications will be made during the mandatory visit in Diani.
9.	KCAA's clarification on global supply chain disruptions.	KCAA has requested bidders to do proper market survey before quoting in order not to terminate the process based on global supply chain disruptions.
10.	How will the flight procedure inspections be done?	As per specifications the drone is not expected to conduct Instrument flight procedures.
11.	Will KCAA still have the usual flight calibrations?	Yes. KCAA will still have the manned flight calibration. The drone is for pre-flight calibration checks.
12.	Clarifications on provision of training.	<p>TRAINING</p> <ul style="list-style-type: none"> • The site training has now been reduced to two weeks and the number of people to be trained has been reduced to two. • The cost for KCAA drone pilot licenses will now be catered for and funded by KCAA. • However, the cost of Factory training and FAT – Will be borne by the vendor and that cost should be included in the contract sum. (refer terms of reference) • Site training will be done at Eldoret. • The manufacturer will cover the cost for site training for two personnel and per the costs indicated in the specifications.
SOLAR POWER SUPPLY SYSTEMS FOR MWAKIRUNGE, NGONG AND MANDERA		
13.	Clarification on the tender title.	KCAA Team Clarified that the tender name remains the same but the solar system is under LOT 2.
14.	What about the solar system and which locations?	KCAA intends to supply the three stations with solar system as indicated in the revised technical specifications attached.
15.	The inverters proposed have inbuilt/hybrid inverters, please clarify?	Either hybrid system or modular system is acceptable.

**For Director General
Kenya Civil Aviation Authority
P.O. Box 30163 - 00100,
Nairobi**

FIRST RESPONSE TO THE CLARIFICATIONS SOUGHT BY INTERESTED BIDDERS VIA EMAIL AND DURING A - MANDATORY PRE-BID MEETING FOR PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT (RE-TENDERING) - TENDER NUMBER KCAA/031/2025-2026,

NO	REQUEST FOR CLARIFICATIONS FROM BIDDERS FOR LOT 1, 2, & 3	KCAA RESPONSES
MAINTENANCE OF DIANI MOBILE AIR TRAFFIC CONTROL TOWER		
16.	Charges for the vehicles	<p>The cost for the airport asses charged by KAA is as follows:</p> <ul style="list-style-type: none"> ➤ Entry of cranes within the airport is Kshs 10,000.00 per entry ➤ Motor vehicles is Kshs 3,000.00 per entry ➤ Personnel under the contractor is Kshs 3,000.00 for temporary pass for a maximum of one week or Kshs 4,000.00 for a longer period. <p>Bidders must include this cost in their price schedule since they will be responsible for payment to KAA.</p>
17.	Manufacturer manual for the tower	It was agreed that a copy of the manufacturer manual for the Air Traffic Control Tower will be provided to the successful bidder.
18.	Payment to public works	The successful bidder will pay an inspection fee of Kshs 350,000.00 to the Ministry of Public works, Chief Mechanical Engineer as facilitation fee for the inspection of works. This should be included in the price schedule.
19.	Inspection and approval of the works	The inspection of the works will be done by KCAA in conjunction with the Ministry of Public works, Chief Mechanical Engineer at various stages.
20.	Licence of mechanical works	The bidder of a member of the joint venture must be registered for mechanical works by National Construction Authority. Copy of the licence and registration certificate must be attached as indicated in the Evaluation Criteria
21.	Electrical works	The bidder or a member of the joint venture must be registered for Electrical works by National Construction Authority. Copy of the licence and registration certificate must be attached as indicated in the Evaluation Criteria
22.	Restriction for movement within the airport	<p>The airport operates form 6:30 am to 6:30pm. Bidders may request for approval to work outside these working hours when necessary.</p> <p>Bidders with airport pass can exit and enter at anytime subject to the existing KAA security procedures.</p>
23.	Workmanship within the airport	The site is located on the airside which has aircraft with highly flammable fuel including the fuel dispenser trucks hence the successful



FIRST RESPONSE TO THE CLARIFICATIONS SOUGHT BY INTERESTED BIDDERS VIA EMAIL AND DURING A - MANDATORY PRE-BID MEETING FOR PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT (RE-TENDERING) - TENDER NUMBER KCAA/031/2025-2026.

NO	REQUEST FOR CLARIFICATIONS FROM BIDDERS FOR LOT 1, 2, & 3	KCAA RESPONSES
		bidder will require to work with extreme caution.
24.	Implementation of the works and methodology	The bidders should provide the work implementation schedule and the work methodology as indicated in the evaluation criteria.
25.	Pistons of the tower	The pistons are rusted and exposed to the harsh weather conditions and will need to preventive maintenance. Bidders were requested to provide a preventive cover for the same.
26.	Preventive maintenance	The bidders shall provide a service and maintenance agreement for the Air Traffic Control Tower (similar works to this tender) with a commencement date at the end of the maintenance works. This maintenance agreement should be for a three (3) year's period and should be costed as appropriate. This costing shall be included in the bid price and indicated separately.
27.	Spare parts	Bidders to include a list of critical spare parts for the tower which should remain fixed for a period of three years
28.	Faulty parts	All faulty parts and systems discovered during maintenance should be repaired or replaced as instructed by the employer
29.	Is there any extension of tender closing/submission date?	Bidders were reminded that the deadline for submission of tenders is Friday, 12th June 2026 at 1100 hours EAT.



**Deputy Director Supply Chain Management
FOR: DIRECTOR GENERAL**

Date: 5th June 2026

ANNEX 1:- Revised evaluation preliminary criteria.

For Director General
Kenya Civil Aviation Authority
P.O. Box 30163 - 00100,
Nairobi

REVISED EVALUATION PRELIMINARY CRITERIA FOR THE SUPPLY, DELIVERY, INSTALLATION, TRAINING, TESTING AND COMMISSIONING OF PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT (SOLAR POWER SUPPLY SYSTEMS FOR MWAKIRUNGE, NGONG AND MANDERA AND MAINTENANCE OF DIANI MOBILE AIR TRAFFIC CONTROL TOWER) (RE-TENDERING). KCAA/031/2025-2026

PART A: PRELIMINARY EXAMINATION FOR DETERMINATION OF RESPONSIVENESS

The following criteria will be used to determine mandatory/preliminary responsiveness of the bidders. Note that all bidders must provide all the requirements under mandatory for them to proceed to the next level of evaluation. Tenders that do not pass the Preliminary Examination will be considered non-responsive and will not be considered further.

No.	Mandatory eligibility criteria to be met by the tenderer
1.	Eligibility - Bidders and their associated firms who have existing/ongoing contracts with KCAA which have delayed beyond the original scheduled completion period in the contract without proper justification or who according to KCAA records, have failed in performance of previous contracts or have had their previous contracts terminated for non-performance are not eligible to participate.
2.	The tender is signed by the person holding a valid power of attorney, without material deviation, reservation or omission. Attach a copy of Power of Attorney signed by the donor and duly witnessed by an advocate or counsel.
3.	Tenderer's eligibility – duly filled and signed confidential business questionnaire
4.	Tenderer is a legally registered entity. Attach a copy of registration certificate or certificate of incorporation from the registrar of companies.
5.	Attach a current copy of CR12 Certificate from Business Registration Services issued within the last six (6) Months.
6.	Attach a valid copy of NCA registration certificate and license for lot 2 and 3 for Electrical and Mechanical works
7.	Attach a valid copy of EPRA registration certificate / license for lot 3
8.	Attach a duly filled and signed Form of Tender for each lot (as per the form attached in section IV of this document)
9.	Provide a Tender valid for 91 days
10.	Attach a duly filled and signed Price Schedules completed for all items in accordance with ITT 14 and ITT 19 for the respective lot
11.	Attach a Valid Tax compliance certificate
12.	Submit signed manufacturer authorization letters (for inverter and battery brands) for lot 2
13.	Duly filled Certificate of Independent Tender Determination

APPENDIX 1 - REVISED EVALUATION PRELIMINARY CRITERIA FOR PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT - (RE-TENDERING)-TENDER NO. KCAA/031/2025-2026.

No.	Mandatory eligibility criteria to be met by the tenderer
14.	<p>Provide 1 Original & 1 copy of bid documents (Ensure serialization/pagination in a sequential manner of ALL pages for the bid submitted) and a soft copy of the bidding documents in USB Flash Drive in a searchable format. The soft copy of the bidding documents to have following attributes: -</p> <ul style="list-style-type: none"> i. The documents should be in PDF ii. The PDF document must be searchable with OCR <p>Bidders MUST chronologically and sequentially serialize/paginate all pages of the tender documents submitted in the format 1,2,3,4-from the cover page to the last page including all attachments</p>
15.	<p>Composition of joint venture where applicable. Attach a copy of the Joint Venture Agreement entered in to by all members or a Form of intent to execute a Joint Venture Agreement together with a copy of the proposed Agreement. All members of joint venture MUST submit a duly filled Party to JV Information Sheet (where applicable). The JV partners must demonstrate and highlight their specific roles in the agreement.</p>
16.	<p>Provide a tender security of Kshs.500,000.00 for lot 1, Kshs 200.000 for lot 2 and Kshs 350,000 for lot 3 valid for 119 days in form of Insurance Guarantee or Demand Bank Guarantee.</p>
17.	<p>Tenderer is not debarred by PPRA or any other Authority. Submit a duly filled and signed Form SD1</p>
18.	<p>Self-declaration that the person/tenderer will not engage in any corrupt or fraudulent practice. Submit a duly filled and signed Form SD2</p>
19.	<p>Duly signed declaration and commitment to the code of ethics</p>
20.	<p>Project commitment/implementation plan – Bidders MUST attach a sample project plan/work program including delivery date of materials, implementation, commissioning, and training clearly indicating the expected completion date of the project (provide details).</p>
21.	<p>Submit a statement in the bidders letter head that the company is not insolvent, receivership, bankrupt or in the process of being wound up</p>
22.	<p>Vendor’s experience for lot 1 :</p> <ul style="list-style-type: none"> i. The Bidder MUST have specific experience in the Supply, Delivery, Installation, Training and Commissioning of Pre-Flight Calibration Drone System OR a similar solution for at least two projects each of a value of Kshs 10,000,000.00 or more within the last Five (5) years. ii. Provide two (2) copies of complete contracts OR LSOs/LPOs on EACH assignment and the corresponding recommendation letters and/or completion certificates for the two contracts provided as evidence.
23.	<p>Vendor’s experience for lot 2:</p> <ul style="list-style-type: none"> i. The Bidder MUST have specific experience in the Supply, delivery, installation, training, testing and commissioning of Solar Power Supply Systems for Mwakirunge, Ngong and Mandera for at least three projects each of a value of Kshs 10,000,000.00 or more within the last Five (5) years. ii. Provide two (2) copies of complete contracts OR LSOs/LPOs on EACH assignment and the corresponding recommendation letters and/or completion certificates for the two contracts provided as evidence.

For Director General
 Kenya Civil Aviation Authority
 P.O. Box 30163 - 00100
 Nairobi

APPENDIX 1 - REVISED EVALUATION PRELIMINARY CRITERIA FOR PRE-FLIGHT CALIBRATION DRONE SYSTEM AND RELATED EQUIPMENT - (RE-TENDERING)-TENDER NO. KCAA/031/2025-2026.

No.	Mandatory eligibility criteria to be met by the tenderer
24.	Vendor's experience for lot 3: i. The Bidder MUST have specific experience in the Repair and Maintenance of hydraulic systems/ equipment and fabrication of motor vehicles for at least three (3) projects each of a value of Kshs 10,000,000.00 or more within the last Five (5) years. ii. Provide three (3) copies of complete contracts OR LSOs/LPOs on EACH assignment and the corresponding recommendation letters and/or completion certificates for the two contracts provided as evidence.
25.	Bidder must have machining and fabrication workshop (Lot 3 only). Provide operation licence for the last five years
26.	Must be licenced by at least one motor vehicle manufacturer for fabrication works. Attach evidence
27.	Submit a due diligence Consent Authorization Letter in the bidder's letter head signed by holder of the power of attorney to obtain information from your clients as per the bidder's contracts attached.
28.	The bidders shall submit the latest three years audited financial statements for the last three years (2025, 2024 and 2023).
29.	Submit evidence that your firm will be able to raise capital of over Kshs 30,000,000.00 for lot 1 and Kshs 10,000,000.00 for lot 2 and 3 for the project
30.	Submit copies of all technical brochures for the proposed equipment where applicable.
31.	Provide Manufacturers Authorization. Provide the manufacturer's authorizations for the proposed solution (provide authentic letter/certificate from the manufacturer) of the proposed solution for lot 1 and 2.
32.	Warranty: The warranty period is three (3) years The bidder MUST indicate total expected life of the equipment to be supplied (lot 1 and 2 only)
33.	Attach a duly signed certificate of site visit/pre-bid meeting form signed by KCAA authorized representative.
34.	Brochures: Include detailed brochures and datasheets of the proposed solution. Brochures in foreign language should be accompanied by a translated version and accompanied by certificate of the translator.
35.	Support and Maintenance: The bidder shall include a proposed SLA for Maintenance to be adopted after the warranty period. The SLA should include the following key deliverables: - i. Period – 3 years ii. Services to be provided within the SLA iii. Response times (lot 1 and 2 only)
36.	The bidders shall provide a service and maintenance agreement for the Air Traffic Control Tower with a commencement date at the end of the maintenance. This maintenance agreement should be for a three (3) years period and should be costed as appropriate. This costing shall be included in the bid price. The quoted maintenance price shall remain firm and fixed for the stated period (FOR LOT 3 ONLY)
37.	REMARKS

LOT 1

ADDENDUM

ADDENDUM

1701

LOT 1: ADDENDUM ON THE TECHNICAL SPECIFICATIONS FOR PRE-FLIGHT CALIBRATION DRONE SYSTEM. TENDER No. KCAA/031/2025-2026

1. Background

The Kenya Civil Aviation Authority (KCAA) provides air traffic management services under its directorate of Air Navigation Services (ANS) using communication, navigation and surveillance systems and attendant procedures. These systems enable the ANS to ensure that aircrafts can reach their destination safely and timely amid the continuous increase in air traffic density.

Indeed, the ANS strongly rely on advanced, unfailing and efficient navigation aid equipment in order to accomplish its mission in the best conditions. Among the requirements of the International Civil Aviation Organization (ICAO), Flight navigation systems must be regularly calibrated, inspected and maintained to ensure that all essential navigation aids for pilots are always working properly. This means that these systems must be tuned to radiate the correct signals in the airspace, at all times.

To achieve this, a combination of ground and air inspections are necessary. At present, KCAA conducts ground measurement inspections (pre-flight calibration checks) using a Portable ILS Receiver (PIR) equipment stationed at specific select pre-determined points on the ground so as to optimize the air inspections by a flight check aircraft.

Both of the above operations have their limitations. The flight calibration aircraft is costly, noisy and not friendly to the environment while the ground one is limited in terms of reachable distance and height. For instance, the ground Instrument Landing System (ILS) calibration operations are in practice restrained to the runway threshold, since they are performed using masts that generally don't go higher than around 25 meters from the ground.

Based on these and other factors, KCAA intends to procure a drone-based pre-calibration system that is able to perform inspections in the far-field. The system would also offer KCAA all other associated benefits as opposed to the present regular means of pre-calibration ground checks.

2. General Requirements

KCAA intends to procure a drone system that should support various inspections including the following:

2.1 Ground Inspections

- (a) ILS and VOR Inspection (ICAO Annex 10 Doc 8071);
 - ILS localizer and glide path inspection;
 - VOR orbital and radial measurements;

- (b) PAPI Inspection (ICAO Annex 14 and Doc 9157);
 - PAPI glide path angle assessment.

2.2. Technical Approaches on Drone Flight Calibration

a) Positioning & Navigation

- **RTK/GNSS**
 - High-precision GNSS receivers provide centimetre-level accuracy.
 - RTK (Real-Time Kinematic) used for live positioning during flight.

b) Signal Measurement Payloads

- **ILS Calibration**
 - Drone carries software-defined radio (SDR) or dedicated RF sensors.
 - Measures *localizer* and *glide slope* signal strength, modulation depth, and alignment.
- **VOR/DVOR Calibration**
 - Antenna payloads measure azimuth accuracy and signal quality.
 - Compare with reference points from GNSS track.
- **DME**
 - Time-of-flight measurement between drone transponder and ground DME station.
- **PAPI (Visual Aids)**
 - Drone-mounted camera + photodiode sensors measure light intensity and angles.
 - Validate glide path angles.

c) Flight Profiles / Trajectories

- **Pre-programmed Calibration Routes**
 - Designed inline with standard ICAO Annex 10 and Doc 8071 procedures.
 - Will include Profiles: approaches, overshoots, orbit circles, level flights.
 - The profiles must support Low-altitude flight close to antenna systems.
 -

d) Data Acquisition & Processing

- **Real-Time Data Link**
 - Measured RF data streamed to a Ground Control Station (GCS).
 - Engineers must see live deviation plots.
- **Onboard Storage**
 - SDR + GNSS raw data stored for post-processing.
 - Ensures redundancy if link fails.
- **Data Fusion**
 - Synchronization of GNSS, and RF signal data.
 - Software compares measured path vs. expected ICAO tolerances.

e) Automation & AI Integration

- **Autonomous Flight Planning**
 - Mission planning software automates calibration flight paths.
 - Should minimize operator error and reduces workload.
- **AI/ML Signal Analysis**
 - Machine learning to detect anomalies (e.g., multipath interference).
 - Trend analysis for predicting equipment degradation.

f) Ground Segment Integration

- **Remote Control & GCS**
 - Operator monitors both drone and RF calibration payloads.
 - RTK base station ensures accurate positioning.

3. Physical Features

The drone system shall be a complete bundle having among others, the following features and accessories.

- (a) Robust frame and durable materials to withstand crashes and rough landings, as well as all-drive motors for increased redundancy;
- (b) Own electronic boards to reduce the amount of cabling and connectors;
- (c) Slide-in battery packs for easy swap of batteries. The batteries should be of large capacity and capable to be fully-charged within one hour or less;

- (d) A high resolution camera optimized for low and high altitudes to get aerial shots of the environment. The camera should be high-quality with a gimbal mount as per specifications to maintain the camera's position even during turbulence.
- (e) Sensors to gather information from the surroundings to keep the drone's position, determine its speed, and avoid obstacles. The sensor suite to include gyroscope, accelerometer, magnetometer, barometer and GPS;
- (f) Interfaces for communication with the ground station, satellites and networking. These components include radio control transceiver (with at least four channels for height, pitch, roll and yaw), Bluetooth for local debugging and controller access, and Wi-Fi/Internet for on-board connectivity with ground station to relay real-time sensing information;
- (g) High-end RTK GNSS for navigation and measurement. A robust navigation system to keep track of the drone's position in real time (position accuracy should be less than 10cm), protect it from harm and make it possible for the drone to complete a mission safely without requiring the assistance of a pilot. The navigation system must have mechanisms to protect GNSS signals from jamming;
- (h) Autonomy level - The drone should be equipped with GPS and autopilot functionality to enable the Operators to plan the drone's flight path before the actual flight begins. The autopilot feature on GPS drones will be used to set autonomous flight instructions at waypoints such as hovering for a certain amount of time. The autopilot functionality will also ensure automatic collision avoidance and taking of photographs and videos without human intervention. KCAA intends to benefit from autonomous operations as it reduces the cost of drone inspection programs and ensures that drone data is accurate, consistent and reliable. At least level 3 autonomy or better is required.
- (i) The drone system should be able to operate in a wide range of environmental conditions including very humid, cold, misty, dusty and hot environments;
- (j) **Other accessories**
 - i. **Maintenance & Tools**
 - **Propeller spares + balancing tool** – replacement props and tool to check vibration balance.

- **Motor cleaning kit** – compressed air, soft brushes, and lubricants for dust/debris removal.
- **Screwdrivers / hex tool set** – for tightening frame, gimbal mounts, and sensor fixtures.
- **Anti-static mat & wrist strap** – for safe electronic handling when working on flight control boards.

ii. Power & Charging

- **Spare flight batteries.**
- **Smart battery management system (BMS)** – for monitoring charge cycles and cell health.
- **Multi-battery charger** – to support field operations with multiple flight hours.
- **Portable power station** – ensures continuous ops in remote aerodromes.

iii. Navigation & Calibration Payload Support

- **Payload mounting kits (custom brackets, vibration isolators)** – to securely mount GNSS, and RF measurement payloads.
- **Cables & connectors** – shielded RF cables, USB-C, micro-USB, SMA connectors.
- **GNSS RTK base station accessories** – tripods, survey poles, and weatherproof housings.

iv. Protection & Storage

- **Hard cases (IP67 waterproof, foam inserts)** – for drone, sensors, and payloads.
- **Propeller guards & motor covers** – protect hardware during transport/ground handling.
- **Weatherproof payload covers** – to shield RF antennas and GNSS sensors in rain.

(k) Specific Technical Requirements & Scope

The proposed drone system shall meet the minimum technical specifications and scoping requirements as detailed in the table below:

PRE-FLIGHT CALIBRATION DRONE SPECIFICATIONS AND SCOPE				
No. List	Item	Specifications	Quantity	Remarks
1.	Drone Aircraft		1	
	Maximum Take-Off Weight (MTOW)	15Kg		
	Number of propelling Rotors	At least 4		
	Flight time	≥ 40min		
	Flight range	≥ 5km		
	Service Ceiling Above Sea Level	>5000m		
	Wind resistance	At least 10m/s		
	Flight speed	up to 15m/s		
	Pitch angle	≥ 25°		
	Speed of Ascent	≥ 5m/s		
	Speed of Descent	≤ 3m/s		
	Hovering Accuracy (P-GPS)	Vertical: ±0.5 m, Horizontal: ±1.5 m		
	Retractable Landing Gear	Optional		
	Return To Home (RTH) On;	Critically Low Battery		
		Remote Control Signal Loss		
		GPS Signal Loss		
		Demand (Initiated By Pilot)		
Geo fencing	Required			
Satellite Positioning Systems	GPS / GLONASS / GALILEO / BDS			
Class	C3 (EU)			
	Remote ID			
	Geo-awareness warning you if about to fly in a restricted area			
	Clear instruction manuals			
Operating Temperature	-5°C to 50°C			
Ingress Protection Rating	IP55			
Batteries	Hot swappable			
	Capacity 5000mAh or better			
	Type - Li-ion			
	Operating Temperature: -20° to 50° C			
	Extra battery set			
Battery Charger	Hot Swap			
	Input voltage - 230Vac±20%			
	Frequency - 50Hz ± 10%			
2.	Drone Aircraft Remote Controller (Portable)		1	
	Screen	7.02-inch LCD touchscreen		
		resolution: 1920×1200 pixels		
		max brightness: 1200 nits		
Operating Frequency	2.4000-2.4835 GHz 5.725-5.850 GHz			
Wi-Fi Protocol	Wi-Fi 6			

PRE-FLIGHT CALIBRATION DRONE SPECIFICATIONS AND SCOPE				
No. List	Item	Specifications	Quantity	Remarks
	Wi-Fi Operating Frequency	2.4000-2.4835 GHz 5.150-5.250 GHz 5.725-5.850 GHz		
	Bluetooth Protocol	Bluetooth 5.1		
	Bluetooth Operating Frequency	2.4000-2.4835 GHz		
	Transmitting Distance	≥ 5Km		
	Effective Isotropic Radiated Power (EIRP)	10dBm @ 900m, 13dBm @ 5.8GHz, 20dBm @ 2.4GHz.		
	Video Output Port	HDMI, SDI, USB (latest versions)		
	Power	Rechargeable Battery (Li-ion or Li-Po) ≥ 5800Ah		
3.	Drone Aircraft On Board Equipment		List	
	• ILS/VOR Receiver	108 - 118 MHz		
	• GP Receiver	329 - 335 MHz		
	• DME Receiver	960 – 1215 MHz		
	• RTK GNSS Processor	GPS L1&L2, GLONASS F1&F2, BEIDOU B1&B2		
	• DATALINK module	Serial Data Rate -115200 bps		
		Full Duplex Mode		
	• ILS/VOR Antenna	VHF		
	• GP Antenna	UHF		
	• DME Antenna	UHF		
• GNSS Antenna	Vertically polarized			
• High Resolution Camera and Gimbal	Resolution - 1080p Field of View - 142° Frame Rate - 30fps			
4.	Portable Ground RTK - GNSS Base Station		1	
	Tracked Signals	GPS/GLONASS/GALILEO/BDS/SBAS		
	RTK Positioning Accuracy	1 cm + 1 ppm (horizontal)		
		1.5 cm + 1 ppm (vertical)		
	Wireless Connection	2.4GHz or 5.8GHz		
	RTK GNSS Processor	GPS L1&L2, GLONASS F1&F2, BEIDOU B1&B2		
DATALINK module	Serial Data Rate -115200 bps			
	Full Duplex Mode			
No. of Channels	Better than 72Channels with triple frequency			
5.	Ground Calculation Station		1	
	Laptop	Hard Rugged casing screen display size - 14 Inches Screen Resolution - 1920 x 1080 pixels Processor - 4.4 GHz core_i7 RAM - 32 GB DDR4 Hard Drive – 1TB SSD		

PRE-FLIGHT CALIBRATION DRONE SPECIFICATIONS AND SCOPE

No. List	Item	Specifications	Quantity	Remarks
		Operating System - Windows 11 Pro Graphics Card Description - Integrated Connectivity - USB-C, USB 3.2 ports, HDMI, Ethernet, Wi-Fi 6 and Bluetooth		
	Flight Inspection Software	Installed in the Laptop		
	Data Storage	Through USB		
	A4 Colour Printer	speed ≥ 8ppm	1	
	Portability and Transportability	Provide lockable transportation hard cases for all equipment designed for ease of transport to different inspection sites.	List	
	Automated Flight Inspection Software (AFIS)			
	The AFIS should be able to perform the following:			
	Data Processing	Real-time Data Processing: On board processing to analyse and evaluate navigational aid performance during flight		A back up copy on removable media e.g. USB Flash disk
	ILS	LOC/GP Displacement Sensitivity		
		LOC/GP Width		
		LOC/GP Alarms		
		LOC/GP Clearance		
		LOC/GP Structure		
		LOC Course Alignment		
		GP Angle		
	VOR	Identification		
		Measured Bearing		
		Bearing Error		
		30Hz Modulation depth & Frequency		
		9960Hz Modulation Depth & Frequency		
		Deviation		
		Deviation Ratio		
		Identification		
	DME	VOR Structure		
		Distance		
		Average Distance error		
		Minimum Distance error		
		Maximum Distance error		
	PAPI	Signal strength		
		Power flux density		
		PAPI Installation horizontality		
		Transition Angle for each PAPI box		
		PAPI System angle		
		Minimum Eye Height over Threshold (MEHT)		
6.			1	

PRE-FLIGHT CALIBRATION DRONE SPECIFICATIONS AND SCOPE				
No. List	Item	Specifications	Quantity	Remarks
		Angular Coverage		
		Symmetry		
		Related Brightness		
	AFIS	Automatic Flight Planning		
		Database of Airports, Runways, Procedures		
		Management of Flight Inspection Operations		
		Reports Generation		
		Printing of Reports		
Training Syllabus (2 Persons factory training and FAT)				
7.	Week 1: Introduction to Drones and its Operation		1	
		Introduction to Drones		
		Drone assembling		
		Powering Up		
		Powering Down		
		Disassembling and Storage		
		Maintenance		
		Setting up of ground stations		
	RTK-GNSS	Calculation Station and Printers	1	
	Week 2: AFIS Overview			
		Software overview (Starting Up and other manipulations)		
		Mission Planning		
		Mission Execution		
		Approach & Localizer		
		o Glide Slope		
		o VOR		
		o DME		
		o PAPI		
		o ALS		
		o Reports Generation	1	
		o Reports archive		
		o Practical Exercises (LOC/GP/VOR/PAPI/ALS)		
	RTK-DGPS Operation			
		Setting up of RTK –GNSS Station		
		System manipulation		
		Taking of coordinates		
		Practical Exercises		
		Maintenance and storage of Equipment		
		Factory Acceptance Tests		

PRE-FLIGHT CALIBRATION DRONE SPECIFICATIONS AND SCOPE

No. List	Item	Specifications	Quantity	Remarks
	Warranty	<p>The Supplier shall provide a comprehensive warranty for all equipment supplied under this contract for a period of three (3) years from the date of acceptance. The warranty shall cover:</p> <ol style="list-style-type: none"> 1. Full service and maintenance of the equipment during the warranty period. 2. Provision of all software upgrades, updates, and security patches released by the manufacturer during the warranty period. 3. Repair or replacement of defective parts and components at no additional cost to the Purchaser, including labor and transportation costs. 4. Warranty coverage shall apply to both hardware and software components of the system. 	3 years	
		<p>Vendor to give a proposal on post warranty agreement for three (3) years that shall include paid service and extended support options after the initial warranty period of three (3) years, including:</p>		
	Post warranty agreement	<ul style="list-style-type: none"> o Corrective maintenance. o Factory calibration and testing of payload sensors (GNSS, RF receivers). o Hardware supply o Software and firmware upgrades to maintenance currency and compliance o Subscriptions if any. 	1	Vendor to give a draft post warranty proposal during bidding and cost but not included in the Form of Tender.

4. Drone Licenses

- (a) The Contractor shall be responsible for drone import licence and be authorized by Manufacturer (Original Equipment Manufacturer Authorization Letter) if not the manufacturer;
- (b) KCAA shall be responsible for registration and operation licences of the drone.

5. Training, Tests and Commissioning

5.1. Factory Training

- The Supplier shall provide factory training for two (2) nominated KCAA personnel at the manufacturer's premises for 10 working days.
- The training shall cover areas as per the syllabus in the technical specifications:
- The training shall be completed prior to shipment of the equipment.

5.2. Factory Acceptance Test (FAT)

- FAT shall be conducted at the manufacturer's premises in the presence of the 2 KCAA personnel.
- FAT shall verify compliance with all technical specifications before shipment.
- A FAT report signed by both Supplier and KCAA representatives shall be issued.

5.3. The supplier shall bear the cost of travel (economy class), visa processing fees, transport while in the manufacturer's country, international DSA of USD 450 per day per trainee for all travel days and training days.

5.4. On-Site Training

- The Supplier shall provide on-site training for two (2) KCAA personnel upon delivery, and commissioning of the system.
- The training shall include:
 - Overview of the training during factory training
 - Demonstration of the drone flight calibration tests on a live navaid equipment these include ILS/DME and DVOR/DME at Eldoret airport.
- The site training will be conducted for 5 working days. The supplier shall cover the cost of the training, air travel to and from Eldoret for the 2 officers and trainees DSA at a local rate of KES. 14,000.00 per day for the training days and 2 travelling days.

8. Documentation and software

All components of the drone system shall be delivered with operating and maintenance manuals in soft or hard copy. The AFIS application shall have various levels of user roles (login credentials) for enhanced security and be delivered in portable media for easy reinstallation in case of problems. The AFS application license shall be a one-off perpetual.

The vendor shall provide Interface Control Documents (ICD) for the whole system which will define interfaces between drone platform, calibration payloads (GNSS, RF receivers), ground station, and external systems.

ICD Scope shall cover hardware, software, data, and communication interfaces.

6. Warranty

As specified in the technical specifications.

6.1. Warranty Period

- The Supplier shall provide a comprehensive warranty of three (3) years from the date of final acceptance.
- The warranty shall cover all equipment, software, and payloads against defects in design, materials, and workmanship.
- Warranty shall include:
 - Free replacement or repair of defective parts.
 - Free software updates, releases, patches, and security upgrades.
 - Technical support and troubleshooting (remote and on-site if required).

6.2. Post-Warranty Guarantee (Years 4–10)

- The Supplier shall guarantee availability of spare parts, consumables, and payload components for a minimum of ten (10) years from final acceptance.

LOT 2

ADDENDUM

STOIS

MUCHNICKA

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

LOT 2: ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA. TENDER No. KCAA/031/2025-2026

KCAA intends to install solar energy as a backup for KPLC in Four (4) of its' stations, Mwakirunge VOR/DME, Lodwar DVOR, Ngong VHF station and Mandera VOR/DME as follows.

No.	Site	Capacity
1	Mwakirunge	20KVA
2	Ngong	15KVA
3	Lodwar	10KVA
4	Mandera	10KVA

The equipment to be supplied are listed within the technical specifications. All equipment should be assembled, mounted and commissioned. Documentation of the process and configurations carried out should also be provided.

TECHNICAL SPECIFICATIONS

1. Scope of Supply & Work of Solar Power Supply System

- 1.1. Scope of supply & works includes all design, delivery, supply, installation, training and commissioning of a 20 KVA Mwakirunge, 10 KVA Lodwar, 15 KVA Ngong, 10 KVA Mandera Solar Power Supply System(SPSS).
- 1.2. The equipment and materials for PV Solar Power Supply System with associated Batteries shall include but not be limited to the supply, erection, testing and commissioning of the following:
 - 1.2.1. Solar PV modules monocrystalline silicon, steel module mounting structures (MMS), aluminium support for the PV modules and reinforced concrete foundations for the structures, bolts and nuts for holding structures and module interconnection.
 - 1.2.2. Digital voltage meter and ammeter, KWh meters and protection relays along with battery.
 - 1.2.3. DC cables including end terminations and other required accessories.
 - 1.2.4. Supply of batteries for the SPSS.
 - 1.2.5. Supply of remote monitoring systems complete with associated equipment to enable remote/local monitoring of all necessary parameters.
 - 1.2.6. Suitable electrical conduit, raceway, cable tray, and/or accessories/trenches.
 - 1.2.7. Protection /isolation systems, Earthling system for PV array, DC power system, AC power system and lightning protection system

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

- 1.2.8. Solar support structures – galvanized steel structures to elevate the PV panels at a minimum of 2 meter above the finished ground level and steel rails, mid and head clumps for mounting and support of PV panels and as per standard specifications. Application of 100mm layer of ballast aggregates to solar field platform.
- 1.2.9. Construction of the foundations for the module mounting structures as per approved design.
- 1.2.10. Construction of associated cable network and conduits.
- 1.2.11. Training of technical personnel.
- 1.2.12. Testing, maintenance and monitoring equipment.
- 1.2.13. Any other equipment / material required to complete the SPSS on turnkey basis.
- 1.2.14. Any other items not specifically mentioned in the specifications but that are required for erection, testing and commissioning in every respect and for safe and efficient operation and guaranteed performance of the SPSS are deemed to be included in the scope of the specifications unless specifically excluded.

1.3. SPV Crystalline Modules

- 1.3.1. SPV Monocrystalline half split modules of minimum 72-cells; and minimum 19.5% module efficiency.
- 1.3.2. Solar modules offered shall be
 - 1.3.2.1. Tier-1 Manufacturer.
 - 1.3.2.2. Certified as per IEC 61215
 - 1.3.2.3. Qualify IEC 61730- Part -1: PV Module Safety Qualification Part -1 Requirement for Construction.
 - 1.3.2.4. Qualify IEC 61730- Part -2: PV Module Safety Qualification Part -2 Requirements for Testing.
- 1.3.3. As SPV modules shall be used in highly corrosive atmosphere throughout their life time so they must qualify IEC 61701.
- 1.3.4. Solar PV Module design shall conform to following requirement:
 - i) Weather proof, DC rated MC4 connector and a cable coming out as a part of the module, making connections easier and secure, not allowing any loose connections.
 - ii) Resistant to water ingress, abrasion, hail impact, humidity, sea water & other harsh environmental factors for the worst situation at site.
- 1.3.5. Module rating is considered under standard test conditions; however Solar Modules shall be designed to operate and perform under site conditions including high temperature, dusty conditions, high humidity and corrosive atmosphere.

1.3.6. Warranties for Modules:

1.3.6.1. Product Warranty

The manufacturer shall warrant the solar module(s) to be free from the defects and/or failures specified below for a period not less than ten (10) years from the date of sale to KCAA.

- i) Defects and /or failures due to manufacturing.
- ii) Defects and/or failures due to quality of materials.
- iii) Non-conformity to specifications due to faulty manufacturing and/or inspection processes.

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

1.3.6.2. Performance Warranty

- i) Bidder shall provide data sheet for solar PV module (under standard testing condition) along with their offer as per these technical specifications.

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

2. GENERAL SPECIFICATIONS

2.1. The general technical specifications for the 20 KVA, 15 KVA, 10 KVA Solar Power System that must be met are as enumerated below:

- 2.1.1. An automatic transfer switch from the solar power to mains power then to an existing standby generator to be provided.
- 2.1.2. A proper lightening protection system to be installed.
- 2.1.3. A proper grounding system is to be installed.
- 2.1.4. All the necessary cable trays to be provided for a complete installation of the system.
- 2.1.5. All the cables required for the complete installation to be supplied.
- 2.1.6. Module Mounting Structures (MMS): A platform for mounting all the PV arrays to be included in the offer.

The MMS to be used for mounting the SPV modules shall be as under:

- i) Fixed-tilt type.
- ii) Azimuth: 0° True South/North.
- iii) Tilt angle: 15° tilt angle shall provide for all sites with adequate spacing to prevent inter-row shading.

The Structure shall comply with IEC 61215/61646.

The mounting steel structure and its galvanizing shall be as per standards. The mounting structure shall be suitably designed for mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads along with applicable wind loads to the base properly.

While designing of MMS additional care is needed to ensure that the material size used is capable to withstand the wind forces generated on account of heavy wind speed of respective wind zone. MMS with documented results of wind tunnel testing and resonant frequency dampening is preferred. To reduce the pressure on structure and foundation, clear spacing between two adjacent modules shall be sufficient to allow wind passage.

The minimum clearance between the lower edge of the modules and developed ground level shall be adequately elevated above relevant floor plain. Minimum 2000 mm or higher and to KCAA approval.

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

Contractor has to choose suitable foundation design(s) depending on soil conditions, geographical condition, regional wind speed, bearing capacity, slope stability etc.

The structure shall be designed to allow easy replacement of any module.

Spacing between rows shall be so designed that shadow of one row of modules to next is avoided.

The Contractor (successful bidder) shall furnish detailed design calculations.

Nut & bolts, supporting structures including module mounting structures shall have to be adequately protected against all climatic conditions prevailing in the area. All fasteners shall be of stainless steel or suitable equivalent.

The mounting structure shall be grounded properly using maintenance free earthing kit.

The mounting structure & foundation shall be designed to withstand applicable speed of wind zone of the applicable site as given in relevant International/Kenya wind load codes / standards. Suitable fastening arrangement such as grouting and clamping should be provided to secure the installation against the specific wind speed. The contractor shall ensure that the design has been certified by a recognized lab/ institution in this regard and submit the same to the KCAA.

- 2.1.7. All necessary circuit breakers, switches and other accessories required for a complete installation to be included.

The DC DB enclosure of dust & vermin proof shall conform to IP 65 protection if out door. Suitable capacity MCBs/MCCB shall be provided for controlling the DC power output to the PV inverter along with necessary surge arrestors.

The DC DB shall be provided with the purpose of providing option for isolating the battery.

- 2.1.8. The bidder to make necessary provision for the proper and complete removal and carting away the existing solar power system and all its accessories to an identified area within the site for storage.

- 2.1.9. After the installation the bidder shall provide comprehensive on-site training of at least 5 technical personnel for 5 days on the operations and maintenance of the solar power system.

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

2.1.10. There shall be site visit prior to bidding. The site survey form should be appropriately filled.

2.2 Deep Cycle Solar Battery

- 2.2.1 Battery test certificate to be provided according to relevant PV GAP, IEC61427 from the principle manufacturer stating the quality assurance and testing methods used for describing its technical specifications.
- 2.2.2 Battery for the solar photovoltaic systems should be deep cycle type and could be Lithium Ion phosphate (LiFePO₄) Battery.
- 2.2.3 The operational life cycle life must be at least 6000 cycles at 20% Depth of Discharge (DOD) and 1500 cycles at 70% DOD.
- 2.2.4 The battery should have higher specific energy density and excellent high rate discharge characteristics.
- 2.2.5 Battery charging instruction should be provided along with the specifications.
- 2.2.6 The maximum permissible Self Discharge should not exceed 5% per month of rated capacity at 25⁰C.
- 2.2.7 The supplier is required to provide for each Battery offered the following data:
- 2.2.8 The battery must be labelled indicating at minimum Manufacturer, Model Number, Voltage and Capacity.
- 2.2.8.1 Type of the battery
- 2.2.8.2 Battery Nominal Voltage
- 2.2.8.3 Battery Capacity Ah@C10
- 2.2.8.4 Life cycle
- 2.2.8.5 Battery performance versus Temperature
- 2.2.8.6 Warranty should be provided minimum for 3 years.
- 2.2.9 The battery should at least provide 2 days of autonomy to be used in the system.
- 2.2.10 The supplier should quote different capacity batteries in the range that are suitable in the system. The capacity of the battery ranges from 100 Ah to 200 Ah.

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

3.0 Charge Controllers.

- 3.1 The charge controller must operate either with Pulse Width Modulation (PWM) or Maximum Power Point Tracking (MPPT) principles. Charge controllers with electro-mechanical relays are not accepted
- 3.2 Charge controllers must be supplied with charge and discharge voltage set points (adjustable), which match the battery requirements to ensure adequate protection and cycling.
- 3.3 The charge controller must ensure safe and reliable operation in the temperature range 5 – 50°C.
- 3.4 Self-consumption must be below 10mA.
- 3.5 Connection terminals must easily admit cables of 6mm² minimum.
- 3.6 Charge controller housing must offer a protection at least IP22. And that used for street light should be IP68.
- 3.7 The charge controller should withstand the rated current from the PV module to the battery and battery to the load.
- 3.8 Charge controller must offer at least signs for Charging Mode, battery state of charge and load disconnect.
- 3.9 Charge controller must be labelled indicating at minimum Manufacturer, model number, voltage & current ratings.
- 3.10 The supplier is required to provide for each Charge Controller offered the following data:
- 3.11 The charge controller must be labelled indicating at minimum manufacturer, Model Number, Voltage, PV and Load Currents.
- 3.12 Type of the controller (Series/Shunt, etc.)
- 3.13 Operating Voltage(s)/ PV and Load Currents.
- 3.14 Indicators, Battery Sensor.
- 3.15 Warranty

The supplier should quote different capacity charge controller in the range that are suitable in the system. The current range for charge controller should be provided between 3 A to 15 A.

4.0 Circuit Protection:

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

- 4.1.1 Battery overcharge and excessive water loss.
- 4.1.2 Battery undercharge and excessive deep discharge.
- 4.1.3 Circuit protection against short circuit of any load.
- 4.1.4 Circuit protection against reverse polarity of any load.
- 4.1.5 Circuit protection against reverse polarity of module or battery.
- 4.1.6 Circuit protection against damage by the high PV open circuit voltage when it is connected to the controller without battery.

5.0 Inverters

- 5.1 Pure sign wave output of AC with 230 V and 50 Hz.
- 5.2 Inverters should be labelled indicating minimum Manufacturer, Model Number, Power Rating, Voltages and Frequency.
- 5.3 Total Harmonic Distortion (THD) should be $< 5\%$
- 5.4 The inverter should have protection against Reverse Polarity, AC Short Circuit, AC Overload, High Voltage Disconnect, Low Battery Disconnect and High Temperature Disconnect.
- 5.5 Indicators with main, charging, inverter ON, Short Circuit and Overload should be incorporated in its design.
- 5.6 The supplier is required to provide full specifications for each DC/AC Inverter offered with the following information:
 - 5.6.1 System rating (W/VA)
 - 5.6.2 Input Voltage (DC)
 - 5.6.3 Output Voltage (AC)
 - 5.6.4 Output Frequency and Waveform
 - 5.6.5 Warrant

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

6.0 The technical specifications for the Solar Power Supply System are as shown below

6.1 Solar Photo Voltaic Panel

1) 20KVA

No.	Specification	Requirement
1.	Cell Type	Monocrystalline half split
2.	PV Capacity	20 KVA
3.	Max Power (Pmax)	≥580W
4.	Max Power voltage (Vmp)	41.95V
5.	Max Power current (Imp)	13.12A
6.	Open circuit voltage (Voc)	49.8V
7.	Short circuit current (Isc)	13.98A
8.	Module Efficiency (%)	23.5
9.	Maximum Series Fuse Rating	15A
10.	Output cables	4mm ² , symmetrical lengths 900mm
11.	Connectors	MC4 compatible IP67
12.	Accessories	All accessories to enable complete installation
13.	Warranty	Standard is 25 years performance warranty, 10-12 years material and workmanship warranty

2) 15KVA

No.	Specification	Requirement
1.	Cell Type	Monocrystalline half split
2.	PV Capacity	15 KVA
3.	Max Power (Pmax)	≥580W
4.	Max Power voltage (Vmp)	41.8 V
5.	Max Power current (Imp)	13.04A
6.	Open circuit voltage (Voc)	49.8V

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

7.	Short circuit current (Isc)	13.98A
8.	Module Efficiency (%)	21.12%
9.	Maximum Series Fuse Rating	25A
10.	Output cables	UV-resistant PV wire, 4mm ² , symmetrical lengths 900mm
11.	Connectors	MC4 compatible IP67/8
12.	Accessories	All accessories to enable complete installation
13.	Warranty	Standard is 25 years performance warranty, 10-15 years material and workmanship (Product) warranty

3) 10KVA

No.	Specification	Requirement
1.	Cell Type	Monocrystalline half split
2.	PV Capacity	10 KVA
3.	Max Power (Pmax)	≥580W
4.	Max Power voltage (Vmp)	41.4V
5.	Max Power current (Imp)	13.04A
6.	Open circuit voltage (Voc)	49.73V
7.	Short circuit current (Isc)	13.93A
8.	Module Efficiency (%)	19.5
9.	Maximum Series Fuse Rating	15-20A
10.	Output cables	4mm ² , symmetrical lengths 900mm
11.	Connectors	MC4 compatible IP68
12.	Accessories	All accessories to enable complete installation
13.	Warranty	Standard 25 years' line performance. 10-15 years product warranty.

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

6.2 Solar charge controller (smart solar MPPT RS 450/100 or equivalent)

No.	Specification	Requirement		
		10KVA	15KVA	20KVA
1.	Capacity of panels	≥ 8 kW	≥ 12 kW	≥ 16 kW
2.	Number of controllers (No.)	2	3	4
3.	Nominal battery voltage	48Vdc	48 Vdc	48 Vdc
4.	Maximum DC PV Voltage	450 - 1000V	450-1000 V	450-1000 V
5.	Maximum charging/load current	200 A	300A	415A
6.	Maximum peak current	200 A	313A	417A
7.	Load control mode	Low voltage reconnects - Adjustable Low voltage disconnect - user selectable manual or automatic reconnection to include warning flash before disconnect.		
8.	Charger regulation method	Solid state, three stage(bulk, absorption, and float), pulse width modulation		
9.	Display panel	The display screen will be backlit alphanumeric display showing battery voltage, DC amperage, cumulative amp hour		
10.	Sensor	Remote battery temperature sensor		
11.	Programmable	Fully programmable battery charging parameters and active cooling		
12.	Casing	Metal case design and fully covered electrical connections		
13.	Inputs	Independent tracking inputs		
14.	Load Control Mode	Low voltage reconnect-Adjustable		
15.	compliance	EN50178, EN61000-6-3 , EN61000-6-1		

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

No.	Specification	Requirement
16.	Warranty	5 years

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

6.3 Inverter either (DEYE/ VICTRON or EQUIVALENT.)

No.	Specification	Requirement		
		10KVA	15KVA	20KVA
1.	Capacity	10KVA	15KVA	20KVA
2.	Power output	≥ 8-9 kW	≥ 12 -13 kW	≥ 16 -18 kW
Indications and alarms				
1.	Switches	3 positions on/off/remote for simple on/off power control plus auto/remote setting that enables distant on/off control of the inverter system		
2.	LEDS	Front panel LEDS to offer continuous status information on load percentage and battery charge level		
3.	LCD display			
Physical properties				
1.	Temperature Range	-5°C - 50°C		
2.	Relative Humidity	0% - 95% (non-condensing) or better		
3.	Rated Input Voltage	48 Vdc		
4.	Maximum input amps/watts	Full continuous load 145A at 48V		
5.	Rated output Voltage	230 Vac ± 5%		
6.	output Frequency Regulations	50/60 Hz +/-0.3%		
7.	Battery recharge rate	Selectable 23/90A		
8.	Continuous output capacity	≥11,000 W		
9.	Noise at 1 metre	≤60dB		
10.	Output Voltage Shape	Pure sine wave		
11.	Overall Optimum Efficiency	>85%		
12.	Power factor (PF)	Typically 0.8 to 0.9		

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

13.	Overload Tolerance	Overload 125% for 10 mins, 125%-150% for 1 min, automatically resume when load become normal
14.	Voltage regulation description	Includes automatic voltage regulation to correct brownouts and over-voltages back to usable levels
15.	Overvoltage correction	Over-voltages are automatically reduced by 10%
16.	Brownout correction	Brownouts are automatically reduced by 10% and 20%
17.	Material of construction	Metal
18.	Degree of protection	IP20
19.	Certifications	RoHs compliant
20.		
21.	Applicable Standards	EN50091-1-EMC, EN50091-2LIV.A
22.	Features	Fan Cooled; Overcurrent Protection; Pure Sine wave Output
23.	Warranty period	5 years

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

6.4 SOLAR BATTERY.

No.	Specification	Requirement		
1.	Type	Lithium ion phosphate or equivalent sealed solar batteries		
2.	Nominal battery voltage	48 V		
3.	Cycle life	≥6,000 cycles		
4.	Chargeable	Yes		
5.	Charge/Discharge Current (A)	Recommended 50 Max 100 Peak (2mins,25°C) 150		
6.	Recommend Depth of Discharge	90%		
7.	Warranty	10 Years		
		10 kVA	15kVA	20kVA
8.	Real Power (kW)	8 kW	12 kW	16kW
9.	Assumed Daily Use	38.4 kWh	57.6 kWh	76.8 kWh
10.	Required Battery Capacity (kWh)	48 kWh	72 kWh	96 kWh
11.	Battery Capacity (Ah)	1,000 Ah	1,500 Ah	2,000 Ah

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

11.0 SCOPE OF WORK

The bidder shall:

- 7.1.1 Supply complete Solar PV systems of 10KVA, 15KVA, and 20KVA capacity. Supply all required components (solar panels, inverters, batteries, mounting, etc.).
- 7.1.2 Install and commission the systems at the designated locations.
- 7.1.3 Train the facility users on system operation.
- 7.1.4 Provide comprehensive documentation, user manuals, and training to end-users.
- 7.1.5 Provide warranty, post-installation support, and maintenance.

7.2 TECHNICAL SPECIFICATIONS

General Requirements

- 7.2.1 All components must meet international and Kenyan standards, including EPRA compliance, and must be designed for **off-grid or hybrid use**.
- 7.2.2 All components shall be compliant with IEC/IS standards.
- 7.2.3 PV modules must be of Tier-1 quality with MNRE/BIS/ IEC approval.
- 7.2.4 Systems should be designed for off-grid operation with hybrid (grid + solar + battery) compatibility.

7.3 Solar PV Modules

- 7.3.1 Type: Monocrystalline half spilt
- 7.3.2 Efficiency: $\geq 22.45\%$
- 7.3.3 Capacity: $\geq 580W$
- 7.3.4 Open Circuit Voltage (Voc) $\geq 52.4 V$
- 7.3.5 Operating voltage (Vm) $\geq 43.35 V$
- 7.3.6 Short Circuit Current (Isc) $\geq 14A$
- 7.3.7 Operating current (Im) $\geq 13.8 A$
- 7.3.8 Certification: IEC 61215, IEC 61730, T1/T2-rated
- 7.3.9 Warranty: 25 years' performance warranty

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

7.4 Inverter

- 7.4.1 **Type:** Hybrid (Grid + Battery + Solar) – (DEYE) or (RS450/100 smart charger controller)
- 7.4.2 **Capacity:** Matching system rating
- 7.4.3 **Technology:** MPPT, Pure Sine Wave.
- 7.4.4 **Protections:** Overvoltage, Overload, Short Circuit, Reverse Polarity, Anti-islanding Protection, Minimum Ingress Protection (IP) rating of IP54.
- 7.4.5 **Features:**
 - 7.4.5.1.1 Automatic switch between solar/grid/battery,
 - 7.4.5.1.2 Should be compatible with lithium batteries.

7.5 Battery Bank

- 7.5.1 Type: LiFePO4 batteries
- 7.5.2 Life: Minimum 10 years (LiFePO4)
- 7.5.3 Battery bank voltage as per design

7.6 Cables

7.6.1 PV Solar Cables

- 7.6.1.1 Conductor: Stranded Tinned annealed copper wire (IEC 60228)
- 7.6.1.2 Size - $\geq 6\text{mm}^2$
- 7.6.1.3 Voltage rating $\geq 1000\text{VDC}$ (As per string voltage design limits)
- 7.6.1.4 Insulation: XLPE
- 7.6.1.5 UV and weather resistant suitable for outdoor application.
- 7.6.1.6 Colours – Red and Black
- 7.6.1.7 The cables shall be laid on structural supports (Cable Channels/Conduits/trays) of adequate strength

7.6.2 Battery Cables

- 7.6.2.1 Conductor: Stranded copper conductor
- 7.6.2.2 Colours – Red and Black
- 7.6.2.3 The cables shall $\geq 35\text{mm}^2$

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

7.6.3 Mounting Structures

7.6.3.1 Material/ corrosion Protection: Hot Dip Galvanized Steel or Aluminium

7.6.3.2 Installation: Rooftop or ground mounted

7.6.3.3 Wind Speed Tolerance: Minimum 150 km/h

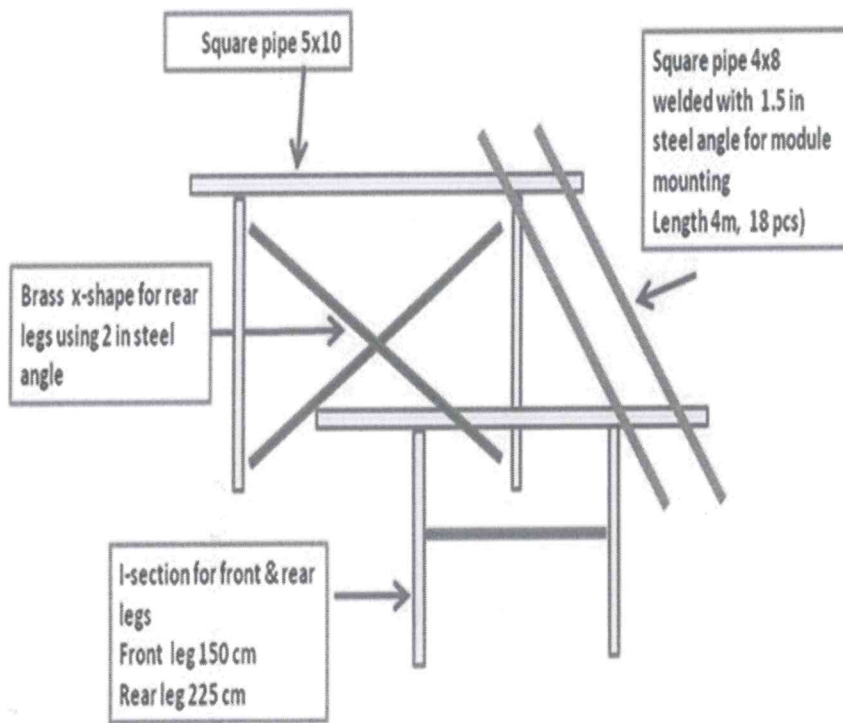


Fig.1 Ground mount system for solar panels:

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

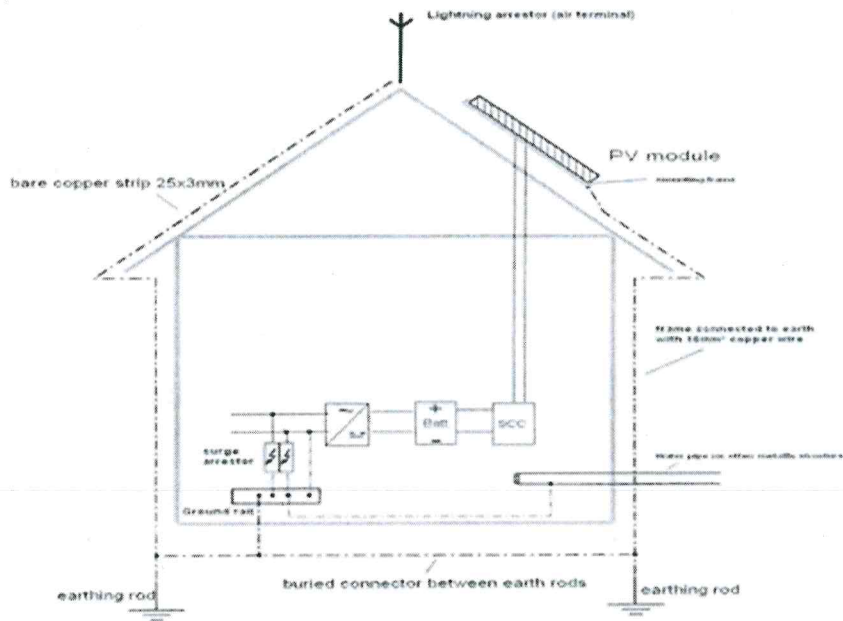


Fig. 2 Equipment bonding for grounding and lightning protection for a solar –PV site.

8.0 DELIVERABLES

8.1 10 KVA System specifications

Component	Specification
PV Modules	10 kW total capacity, monocrystalline half split, min. 20% efficiency
Inverter	10 KVA hybrid inverter, MPPT-based, pure sine wave
Battery Bank	Minimum 20 kWh usable capacity (Lithium-ion)
Mounting Structure	Hot-dip galvanized iron/aluminium, ground/rooftop mounted
Accessories	DC and AC junction boxes, surge protection, earthing kit, cabling, breakers
Monitoring System	Online monitoring with data logging required
Backup:	Minimum 8 hours at full load

Item description	Unit	Quantity
10kVA , 48VDC hybrid inverter charger (Type Victron or equivalent)	No.	1

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

LiFePO4 solar battery	No.	8
Steel fabricated battery rack/cabinet all weather proof	No.	1
580W, 48VDC solar panels (Type Jinko or equivalent)	No.	24
100AMPS, 250VDC Smart MPPT controller (Type Victron or equivalent)	No.	3
Solar panels roof/Ground mount structure	Lot	1
AC mains manual bypass switch	Lot	1
Automatic change-over module	No.	1
DC solar isolators	No.	2
Battery fuse	No.	1
Battery monitor , control panel & Monitoring Unit c/w all necessary communication equipment and data cable (as Colour Control GX or equivalent)	Lot	1
AVS surge guard (30A)	No.	1
Installation materials	Lot	1

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

8.2 15 KVA System

Component	Specification
PV Modules	15 kW total capacity, monocrystalline half split, min. 20% efficiency
Inverter	15 KVA hybrid inverter, MPPT-based, pure sine wave
Battery Bank	Minimum 30 kWh usable capacity
Mounting Structure	Ground/rooftop mounted, galvanized
Accessories	Same as 10 KVA
Monitoring System	Online/remote monitoring required
Backup:	Minimum 8 hours at full load

Item description	Unit	Quantity
15kVA , 48VDC hybrid inverter charger (Type Victron or equivalent)	No.	1
LiFePO4 solar battery	No.	12
Steel fabricated battery rack/cabinet all weather proof	No.	1
580W, 48VDC solar panels (Type Jinko or equivalent)	No.	26
100AMPS, 250VDC Smart MPPT controller (Type Victron or equivalent)	No.	3
Solar panels roof/Ground mount structure	Lot	1
AC mains manual bypass switch	Lot	1
Automatic change-over module	No.	1
DC solar isolators	No.	2
Battery fuse	No.	1
Battery monitor , control panel & Monitoring Unit c/w all necessary communication equipment and data cable (as Color Control GX or equivalent)	Lot	1
AVS surge guard (30A)	No.	1
Installation materials	Lot	1

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

8.3 20 KVA System

Component	Specification
PV Modules	20 kW total capacity, high-efficiency mono/polycrystalline
Inverter	20 KVA hybrid inverter, 3-phase optional, MPPT technology
Battery Bank	Minimum 40 kWh usable capacity
Mounting Structure	Racking for mounting, Galvanized iron /aluminium, ground/roof compatible
Accessories	Full protection (SPD, breakers, fuses, lightning arrestor, etc.)
Monitoring System	Web-based real-time monitoring system required
Backup	Minimum 8 hours at full load

Item description	Unit	Quantity
20kVA , 48VDC hybrid inverter charger (Type Victron or equivalent)	No.	1
LiFePO4 solar battery	No.	16
Steel fabricated battery rack/cabinet all weather proof	No.	1
580W, 48VDC solar panels (Type Jinko or equivalent)	No.	34
100AMPS, 250VDC Smart MPPT controller (Type Victron or equivalent)	No.	4
Solar panels roof/Ground mount structure	Lot	1
AC mains manual bypass switch	Lot	1
Automatic change-over module	No.	1
DC solar isolators	No.	2
Battery fuse	No.	1
Battery monitor , control panel & Monitoring Unit c/w all necessary communication equipment and data cable (as Color Control GX or equivalent)	Lot	1

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

AVS surge guard (30A)	No.	1
Installation materials	Lot	1

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

8.4 Accessories

- 8.4.1 DC and AC Distribution Box
- 8.4.2 Lightning Protection, Earthing Kit
- 8.4.3 Surge Protection Devices (SPD), MCBs, MCCBs.
- 8.4.4 Cables and Wiring (UV resistant, certified, ISI Marked)
- 8.4.5 Weatherproof enclosures.
- 8.4.6 Digital Clamp Multi-meter (minimum range 0-600V DC, 0-300 V AC, accuracy min 1%, 0.01V resolution)
- 8.4.7 Current Clamp meter (Range 0-40A, accuracy 1%, resolution 0.1A for AC and DC 40A, including thermocouple and leads. Recommended model: TCM 02 DC/AC clamp meter – 600 VDC).
- 8.4.8 Step Ladder (To reach Solar array)
- 8.4.9 Solar PV Analyser Range 0-20A, 1000 VDC. Direct MC4 connector
- 8.4.10 Squeegee: clean solar array

8.5 Monitoring System

- 8.5.1 Local LCD (Cerbo gx colour control system or equivalent) Monitoring display mandatory.
- 8.5.2 Web-based real-time monitoring system
- 8.5.3 Mobile App access (optional)

8.6 Deliverables

- 8.6.1 Solar Panels
- 8.6.2 Inverter Unit
- 8.6.3 Battery Bank
- 8.6.4 Mounting Structures
- 8.6.5 Wiring & Protection Systems
- 8.6.6 Earthing Kit
- 8.6.7 Remote Monitoring Unit
- 8.6.8 Installation & Commissioning
- 8.6.9 User Manual & Training

8.7 Eligibility Criteria

ADDENDUM FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR POWER SYSTEM AT THE DVOR/ DME STATIONS IN MWAKIRUNGE 20KVA, NGONG 15 KVA, LODWAR 10KVA, MANDERA 10KVA

- 8.7.1 The bidder must be a registered company with at least 3 years of experience in solar PV installation.
- 8.7.2 Should have completed at least three similar projects in the last 5 years.
- 8.7.3 Must submit valid certifications (ISO, MNRE, BIS, etc.).
- 8.7.4 Financial capacity to handle the scope (turnover, solvency, etc.).

8.8 Bidders must:

- 8.8.1 Be a **registered company in Kenya**.
- 8.8.2 Hold valid **EPRA electrical contractor license** (Class T3 or above).
- 8.8.3 Be tax compliant (Valid **KRA PIN, Tax Compliance Certificate**).
- 8.8.4 Provide at least **3 references for similar projects** in the last 5 years.
- 8.8.5 Demonstrate financial capacity (submit audited accounts for past 2 years).
- 8.8.6 Submit signed manufacturer authorization letters (for inverter and battery brands).

8.9 Warranty:

- 8.9.1 Minimum **5 years** on inverter and
- 8.9.2 Minimum 25 years for solar panels PV panels,
- 8.9.3 Minimum **2-year** maintenance support post installation and on other components.