02 FIRMS CONTRACTED IN UPNEDA FOR Solar Heritage High Mast				
S.N.	Name Of Firm	Address	Name and Mobile Number of Representative	E-Mail-ID
1	M/s KLK Ventures Pvt Ltd	A- 52, Sector-58, Noida-201301(U.P)	Akshat Jain 8595846025	headoffice.klk@gmail.com
2	M/s Goldwyn Limited	60, Sector 60, Noida, 201301	Vivek Sharma 9958857626	govt2@goldwynled.com

SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

SCOPE OF WORK:

The scope of work includes design, supply, installation, commissioning of **Solar LED Heritage High Mast Lighting System** including 05 years comprehensive warranty, operation and maintenance in various Primary Health Center, Main Roads/Chaurahas, Animal Markets, Small Markets (Hatt), Panchayat houses, Public Drinking water Sources, Cross Roads/ Road Junctions, Fair Grounds etc. of various solar cities of Uttar Pradesh as per the following specifications.

GENERAL TECHNICAL SPECIFICATION:

A Solar PV White- LED High Mast Light consist of white LED luminary of maximum 4*30 Watt (LED + Driver) as per configuration along with solar PV modules and battery of given capacity, necessary control electronics-inter connecting wires / cables, module mounting structures etc. to operate the load for dusk to dawn. The broad performance specifications of a White Light Emitting Diode (W-LED) light source based solar Heritage High Mast lighting system are given below

BROAD PERFORMANCE PARAMETERS

PV Module	Only indigenous modules shall be used in the Project. SPV module aggregate capacity 800 Wp (200 Wp X 4 Nos.) at under STC. Module Voc minimum of 21V.
Battery (Li-fe-Po4)	Lithium Ferro Phosphate battery aggregate capacity 12.8 Volt, 200Ah (50Ah x 4 nos.) 12.8 Volt 50 Ah of one unit.
Light Source	White Light Emitting Diode (W-LED) 4x30 Watt (LED +Driver) Using LEDs which emits ultraviolet light will not be Permitted
Light Out put	White colour (colour temperature 5500-6500 K). Lumen efficacy of LED- min 135 lumens/Watt @350 mA. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred.
Average duty cycle	Dusk to dawn

Make of Items must be as per the BIS/ MNRE technical specification and equivalent make offered by the bidders in the Bid. The Bidders may change the make of items with the permission of competent authority of UPNEDA as and when required on valid circumstantial conditions. The bidder shall provide Test Certificate of the proposed make of items issued from MNRE authorized testing center or NABL accredited test lab.

MINIMUM TECHNICAL REQUIREMENTS / STANDARDS

1. **DUTY CYCLE**

2. The Solar PV White- LED High Mast Light system should be designed to operate for dusk to dawn.

3. SPV MODULES:

i. Only indigenous modules of reputed brand IEC Tested or equivalent BIS standards shall only be used in the project. Crystalline high power/efficiency cells shall be used in the Solar Photovoltaic module. The power output of the each module shall not be less than 200 Wp at load under standard test conditions (STC).

ii. The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.

iii. Crystalline high power/efficiency cell shall be used in the Solar Photovoltaic module. The cell efficiency should not be less than 16%.

iv. PV module must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

v. The terminal box on the module shall be IP 65 and designed for long life out door operation in harsh environment should have a provision for opening for replacing the cable, if required.

vi. The offered module shall be in accordance with the requirements of MNRE. The Modules and Cells should be manufactured in India and should be complied with the prevailing MNRE Approved List of Models and Manufacturers of Solar Photovoltaic Modules and subsequent amendments and clarifications issued until the bid submission deadline, shall be applicable for this Bid. The Successful Bidder must procure Solar PV Modules from MNRE ALMM List as per the UPNEDA office order no 144 dated 08.04.2024.

vii. Latest edition of IEC 61215 edition II / IS 14286 for Crystalline and shall be certified by MNRE authorized test center. The bidder shall submit appropriate certificates.

viii. PV modules must quality to IEC 61730 Part 1- requirements for construction & Part 2 – requirements for testing, for safety qualification.

ix. Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided and if required, blocking diode(s) may also be provided.

x. IDENTIFICATION AND TRACEABILITY

Each PV module must use a RF identification tag (RFID), which must contain the following information:

(i) Name of the manufacturer of PV Module
(ii) Name of the Manufacturer of Solar cells
(iii) Month and year of the manufacture (separately for solar cells and module)
(iv) Country of origin (separately for solar cells and module)
(v) I-V curve for the module
(vi) Peak Wattage, Im, Vm and FF for the module

(vii) Unique Serial No and Model No of the module
(viii) Date and year of obtaining IEC PV module qualification certificate
(ix) Name of the test lab issuing IEC certificate
(x) Other relevant information on traceability of solar cells and module as per ISO 9000 series.

4. BATTERY

Lithium-Ferro-Phosphate (Li-Fe-Po4) Battery :

(1) The Battery pack should be got tested as per IEC 62133-2012 or BIS latest standard (IS-16046 & IS-16047) from BIS recognized labs or MNRE accredited test center, (Certificate Enclosed). The cell capacity should be 3.2 volt, 10AH/ 50AH.

(2) Capacity of the battery shall not be less than 12.8 V (nominal), 50 Ah at STC, 640 Watt Hour (4 *50 AH= 200 AH, i.e. 2560 Watt Hour).

(3)**The battery cycle life should be 2000 cycle at 95% discharge.**

(4)BMS (Battery Management System) should be part of battery pack and battery pack enclosure should be as per standard. The battery pack should be integrated with the system in such way that it is theft proof and not removable from system. It should be installed with combination of module structure/luminaire. The height of battery pack will be approximate, 6.5 meters above the ground. The system must withstand wind velocity of 180 km/hr. The battery pack should be capable of high rate of heat dissipations. The battery box should be acid proof and corrosion resistant, hot dip galvanized metallic box (IP 65) with anti-theft locking arrangement.

4. The battery should operate between temperature range of 0 degree C to 55 degree C

The other feature of the battery should be:

Sr. No.	Description	Specifications
1	Battery Configuration	12.8V- 200AH; LifePO4 (4*50AH)
2	Working Temperature Range (both for charging & discharging)	0-60 deg C
3	Storage Temperature Range	@ 0-25 Deg- 6 months
4	Cycle Life (Full charge to full discharge @ 25 deg C before capacity of battery falls below 75%	more than 2000 Cycles
5	Battery Warranty	5 years
6	Capacity of Individual Cells	3.2V cell of 10 AH/ 50 AH
7	Type of Cell	Prismatic
8	Nominal Capacity	12.8 volt - 50AH
9	Nominal Voltage	12.8V
10	Voltage Range	10.5V - 14.6V
11	Total Energy	640 WHr

12	Rated Charging current	20 Amps
13	Maximum Charging current	20 Amps
14	Maximum Discharging Current	10 Amps
15	Discharge Cut off Voltage	>10.5V
16	Over Charge Cut off Voltage	14.4V+/- 0.2V
17	Charging Time	Around 5 - 5.5 Hours

1. **Light Source**:
   i. The light source will be of white LED type The color temperature of white LEDs used in the system should be in the range of 5500 degree K – 6500 degree K. Use of LEDs which emits ultraviolet light will not be permitted. The temperature of heat sink should be not increase more than 20 degree centigrade above ambient temperature during the dusk to dawn operation.
   ii. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred. The light output from the white LED light source should be almost constant. **The lamps, DC-DC driver and battery management system (BMS) should be housed in aluminum die-casted casing suitable for outdoor use and shall comply with IP 65.**
   iii. The lamps should be housed in an assembly suitable for outdoor use and shall comply with IP65. The LED housing should be made of pressure die cast aluminum having sufficient area for heat dissipation and heat resistant toughened clear glass/ high quality poly carbonate fitted with pressurized die cast aluminum frame with SS screws. The temperature of heat sink should not increase more than 30 degree C above ambient temperature even after 48 hrs. of continuous operation. This condition should be complied for the dusk to dawn operation of the lamps while battery operating at any voltage between the loads disconnect and charge regulation set point.
   iv. High power LED of minimum 1 watt each capacity capable to withstand maximum 1 amp driving current having lens angle greater than 120 degree shall be used. The LED of reputed make having LM 80 and LM 79 test report shall only be used.
   v. The LED efficacy should be more than 135 lumen / watt ,the total luminaire efficacy should not be less than 125 lumens per watt. (Including all loses) i.e the lumens output of each luminaire should not be less than 3750 lumens.
   vi. All LED in circuit must be connected in series only. It must incorporate fail short mechanism in all LEDs. The LEDs used in the luminaire should have life time more than 50,000 hrs.
   vii. The lumen depreciation of LED shall not be more than 30% even after 50,000 burning hours.
   viii. Power consumption of the each LED Luminaire / Lighting unit shall not be more than 30 W (including LED Driver power loss).
   ix. The lux level over a 16 meter of radius should not be less than 5% at the point mentioned below in the lux level distribution chart.
   The chart is plotted for 7 meter high, with lamp bracket arm of 1 meter with 5 degree. Grid spacing 1×1 meter. Maintenance factor 0.8.

The average Lux should be min 6 lux and average/min = min 0.25

x. Other Parameters :

- LED DC current regulation – better than 3 %
- Input – 12 V DC
- Driver Type- DC-DC (as per IEC 62384)
- CRI - 70 % Typical
- Lighting quality- Free from glare and flickering and UV
- Ambient temp– upto 50 deg
- DC to DC convertor efficiency > =90 %

xi. The connecting wires used inside the luminaries, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided at input side.

xiii. Auto resettable reverse polarity protection shall be provided

xii. LED lighting unit shall comply to LM -79-08 Standards and copy of test certificate should be submitted.

xiii. The make, model number, country of origin and technical characteristics of white LEDs used in the lighting system must be furnished.

xiv. The luminaries must have light distribution polar curve. The bidder should submit the polar curve of luminaries in LM 79 report.

2. ELECTRONICS

MPPT/PWM charge controller to maximize energy drawn from the Solar PV array. The MPPT/PWM charger shall be microcontroller based. The MPPT/PWM should have four stage charging facilities i.e Bulk, Absorption, Float and Equalization. The auto equalization facilities for battery at every (30+_2 days) and provision to verify it during testing should be incorporated. The PV charging efficiency shall not be less than 90% and shall be suitably designed to meet array capacity. The charge controller shall confirm to IEC 62093, IEC 60068 as per specifications.

i. MPPT Charge controller to maximize energy drawn from the solar PV array. The MPPT Charger should be microcontroller based. The charge controller should have:

Solar Charge Controller

Sr No.	Description	Specification
1	Charge controller Type	PWM/ MPPT type -Maximum Power point Tracking EN 50530:Performance evaluation of maximum power point tracking (MPPT)
2	Charge controller Rating @ Related Voltage	20 Amps
3	Module Rating	SPV module aggregate capacity 800 Wp (200 WpX 4 Nos.) at under STC. Module Voc minimum of 21 V.
		36 Cell configuration

		Voc-> 21 Volts
		Vmp-16.4 volt ± 0.2 at STC without MPPT

i. Protection against polarity reversal of PV array and battery, Over Current, Short Circuit, Deep Discharge, Input Surge Voltage; Blocking Diode protection against battery night time leakage through PV Module

ii. Electronics should operate 21volt and 10 volt and its Euro efficiency should be at least 90 %.

iii. The system should have protection against battery overcharge and deep discharge conditions. The numerical values of the cut off limits of lower voltage should not be less than 11.2 Volt and over voltage cutoff should be 16.5 V

iv. Full protection against open circuit, accidental short circuit and reverse polarity should be provided

v. Charge controller shall have automatic dusk-dawn circuit based on spv module as sensor for switching on/off the high mast light without manual intervention. The sensor must not get triggered by impulse lighting like lightning flashes and firecrackers.

vi. The self-consumption of the charge controller shall not be more than 20 mA at rated voltage and rated current.

vii. Adequate protection shall also be incorporated under no-load conditions (i.e. when the system is ON & the load (LED Lamp is removed)

viii. The system should be provided with 2 LED indicators: a green light to indicate charging in progress and a red LED to indicate deep discharge condition of the battery. The green LED should glow only when the battery is actually being charged.

ix. All capacitors shall be rated for max. temp of 105° C.

x. Resistances shall preferably be made of metal film of adequate rating.

xvii. Device shall have adequate thermal margin should be at least 25 degree below the allowable junction temperature while operating at an ambient temperature of 55 degree C and full load.

xi. Fibre glass epoxy of grade FR 4 or superior shall be used for PCB boards.

Preferably the electronics (both charge controller and driver) should be housed in a separate box and installed on pole suitably in order to perform the repairing of electronics quickly without removing the whole luminaire.

xii. Inbuilt remote monitoring facility should be available in MPPT Charge Controller and it should record following System Parameters at a fixed time interval for system health analysis (time interval should be changeable from 15 minutes to 4 hours and will be

intimated at the time of award of work as per the requirement).

The detail regarding Remote Monitoring Systems are given below:-

1. **Battery Parameters:**
   - Battery Voltage (BV).
   - Battery Current (BI).
   - Battery Power (BP)
2. **Solar PV Parameters:**
   - Solar PV Voltage (SV)
   - Solar PV Current (SI)
   - Solar PV Power (SP)
3. **Load Parameters:**
   - Load Voltage (LV).
   - Load Current (LI)
   - Load Power (LP)
   - Load ON/OFF condition
4. System shut down due to fault (event fault should be recorded)
5. Site coordinates (Latitude and Longitude)
6. The remote monitoring can be done using any available communication mode like GSM/GPRS/SMS. The cost for the same should be borne by the successful bidder.

Technical Requirement/Standards

Item / System	Applicable BIS /Equivalent IEC Standard Or MNRE Specifications	
	Standard Description	Standard Number
Solar PV Systems Charge Controller/MPPT Units and Protections	Crystalline Silicon Terrestrial PV Modules	IEC 61215 and 61730 part-1 and part-2, IS14286 Test Certificates / Reports from IECQ / NABL accredited laboratory for relevant IEC / equivalent BIS standard. IECIEC 62093 Equivalent BIS Std.
Storage Batteries	Secondary Cells and Batteries for Solar Photovoltaic Application-General Requirements and Methods of Test IS 16270:2014	IS 16270:2014
Cables	General Test and Measuring Method PVC insulated cables for working voltage up to and including 1100 V UV resistant for outdoor Installation	IEC 60189 IS 694/ IS 1554 IS/IEC 69947
Charge Controllers/ Luminaries		IP 65

LED	LED performance Luminary performance	LM -80-08 LM 79-08

2.4 MECHANICAL HARDWARE

(i) A galvanized metallic frame structure to be fixed on the pole to hold the SPV module(s). The frame structure should be fixed at 30 degree from horizontal facing true south.

(ii) The Heritage solar High mast pole should be made of High quality cast iron with ornamental looks from aesthetic point of view. The Height of pole shall be 9 mtr, the bracket arrangement for suspended LED lighting shall be kept at minimum 7 mtr height.

(b) The size of the pole shall be min 90 mm at Top side, 230 mm at bottom side with

thickness of 8 mm minimum.

(d) The base plate of pole shall be of suitable size not less than 300 X 300 X 20mm duly welded to pole.

(f) Pole should have the arrangement at top for mounting of Solar panel of design capacity with mounting structure at an angle of latitude $\pm 2^0$ degree.

(g) The four LED luminaire shall be mounted on this pole at height of 7 meter from pole bottom.

(h) The pole shall be mounted on suitable RCC foundation at least 2 meter deep and 0.3 meter above ground with 4/6/8 bolt of suitable size of min 20 mm.

(i) The Nut -Bolts in battery box and panel structures should be proper riveted to ensure the theft.

(j) The design and foundation details of the pole shall be got approved from UPNEDA before execution of work.

vi) BATTERY BOX :

The battery box should be acid proof and corrosion resistant, hot dip galvanized metallic box (IP 65) with anti-theft locking arrangement. The size of box should be as per battery pack size The battery box is to be properly rest/mounted on pole approx. 6.5 meters of height from ground level. The edges of box should be turned properly to give smooth edge and good strength. Components and hardware shall be vandal and theft resistant. All parts shall be corrosion- resistant.

vii) ELECTRIC CABLE

The electric cable used shall be twin core PVC insulated water and UV resistance

copper cable of minimum size 1.5mm. Cable shall meet IS 1554 / 694 Part 1:1988 & shall be of 650 V/ 1.1 kV.

2.5 OTHER FEATURES

A toll free number (i.e. 1800 180 0005) of IVRS of UPNEDA and 14 digit UID number of minimum computer font size 72 or 13 mm (issued/provided by UPNEDA) is to be embossed/ punch on pole between 1-1.5 meter above from ground level by contractor/ bidder, which in case of non-working/ operational problems etc of system will be dialed by the beneficiary etc to lodge a complaint in respect of system problems. The IVRS will divert the complaint to Contractor/ bidder through E mail, SMS etc. The contractor/ bidder will have to rectify the same to make/ restore the system to working position within 72 hours in the warrantee period of 5 years, failing which the system may be get rectified on contractor/ bidder cost and the cost will be recovered by contractor/ bidders pending claims what so ever and appropriate action as per noncompliance etc of agreement will be considered/taken.

2.6 INSTALLATION OF SYSTEM:

The system should be properly installed at site. The SPV module mounting structure along with telescopic octagonal pole should be properly grouted depending upon the location and requirement of the site. The grouting should be such that it should withstand the maximum wind speed /storm of 180 kmph. The pole should be rest on a suitable foundation. (RCC Foundation size 600 mm x600 mm x 2000 mm deep and 300 mm above the ground level. must have 4/6/8 nos. foundation bolts of 1600 mm & 20mm dia.) Adequate space should be provided behind the PV module/array for allowing un-obstructed air flow for passive cooling. Cables of appropriate size should be used to keep electrical losses to a bare minimum. Care should be taken to ensure that the battery is placed with appropriate leveling on a structurally sound surface. The control electronics should not be installed directly above the battery. All wiring should be in a proper conduit or capping case. Wire should not be hanging loose. Any minor items which are not specifically included in the scope of supply but required for proper installation and efficient operation of the SPV systems is to be provided by the manufacturer as per standards.

2.7 WARRANTY

The mechanical structures, electrical works including power conditioners/inverters/charge controllers/ maximum power point tracker units/distribution boards/digital meters/ switchgear/ storage batteries, etc. and overall workmanship of the SPV power plants/ systems must be warranted against any manufacturing/ design/ installation defects for a minimum period of 5 years.

Traceability of the product to be supplied

In order to prevent the misuse of the product such as unauthorized sale or diversion to the open market, the following incorporation shall be made in the product.

a) Engraving (or) Screen printing of UPNEDA at a suitable place on the main components viz., SPV Panel, Battery, LED Lighting Units to be used in the installation of the solar high mast lighting systems.

b) The unique system ID number as provided by UPNEDA shall be embossed or punch or permanently riveted on each pole and battery box of the system.The UID number painting or marking will not be allowed.

WARRANTY AND MAINTENANCE

1. The PV modules will be warranted for a minimum period of 25 years from the date of supply. (Output wattage should not be less than 90% at the end of 10 years and 80% at the end of 25 years).

2. The mechanical structures, electrical components including evacuation infrastructure and overall workmanship of the solar plant system must be warranted for a minimum of 5years from the date of commissioning and handing over of the system.

3. The Comprehensive Maintenance (within warranty period) may be executed by the firm themselves or through the authorized dealer/ service center of the firm in the concerned district/Division.

4. UPNEDA is imparting training to ITI/Diploma holders under "Suryamitra Skill Development Program". The successful contractor(s) should engage them in their service centers to provide necessary repairs and maintenance service including installation of the systems during the time of execution. Necessary maintenance spares for five years trouble free operation shall also be supplied at service centres.

5. The contractor/ bidder shall be responsible to replace free of cost (including transportation and insurance expenses) to the purchaser whole or any part of supply which under normal and proper use become dysfunctional within 7 days of issue of any such complaint by the purchaser.

6. The service personnel of the Successful Bidder will make routine quarterly maintenance visits. The maintenance shall include thorough testing & replacement of any damaged parts Apart from the any complaint registered/ service calls received / faults notified in the report generated by the IVRS should be attended to and the system should be repaired/ restored/ replaced within 72 hrs

7. The deputed personnel shall be in a position to check and test all the components regularly and upload in on UPNEDA System Dash-Board.

8. Normal and preventive maintenance of the systems will also be the duties of the deputed personnel during quarterly maintenance visits.

9. During operation and maintenance period of the systems, if there is any loss or damage of any component due to miss management/miss handling or due to any other reasons pertaining to the deputed personnel, what-so-ever, the supplier shall be responsible for immediate replacement/rectification. The damaged component may be repaired or replaced by new component.

Details of current approved rates of various solar systems by UPNEDA

S.N.	Name of System	Rate Including GST @Rs.
1	2	3
1	Solar Heritage High Mast	197610.00
2	Smart Solar Street Light	220657
3	18 Watt Street Light including RMS (DCR)	22464
4	18 Watt Street Light including RMS (Non-DCR)	20964
5	Solar Hight Mast	107985
6	Solar Tree (1kw)	300432