Subhead- 12
Solar Energy Related Works

Item No.	Description of Items	Unit	Unit Rate in Dhaka & Mymensingh Zone (Tk)	Unit Rate in Chattogram & Sylhet Zone (Tk)	Unit Rate in Khulna,Barishal & Gopalganj Zone (Tk)	Unit Rate in Rajshahi & Rangpur Zone (Tk)
12.1	**OFF- GRID SOLAR PANEL SYSTEM :** Supplying, installation, testing & commissioning of following capacity solar system (off grid) for 2 Hrs backup with required quantities of mono / poly crystalline silicon solar PV modules,Solar suited Deep Cycle Lead Acid battery (12V), with required size maximum power point tracking (MPPT)/PWM charge-controller & inverter as per relevant international standards & certification such as IEC / CE / UL as per following specification to produce AC- 220V, 50Hz pure sine wave for suitable use of all standard AC appliances with battery racks / cabinet, solar PV mounting structure, combiner box, fuse box, meter etc. system includes compatible solar cables, equipotential bonded and earthed with the building earth electrode which is conventional and / or chemical electrode system and all accessories as required to complete the installation with one year free operation & maintenance of the system which shall have the following features: **SOLAR PV MODULES/PANEL:**					

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	I. Parameters for PV Panel should be at Standard Test Condition of solar irradiance of 1000 W/m^2, Cell Temperature of 25 degree Celsius and AM of 1.5g. II. Solar PV module / panel shall be inconformity with the requirement of BDS IEC 61215, IEC 61730 (latest edition) along with VDE/NEMA/JIS/BS standards. Certificate issued by the internationally recognized authority such as CE / TUV /DNV or equivalent certifying body shall have to be submitted by the bidder for the above mentioned international standard. Manufacturing facility should be ISO9001, ISO14001 quality management system certified. III. Solar panels shall be installed pointing to the right direction to capture most of the solar energy to transform it into electricity with the facility to be adjusted from the horizontal to 12 degree in summer and to 35 degree in winter to get the maximum efficiency and must face the true south in our country. For fixed panel mounting system, the panels must be tilted (22.5 ± 1) degree with horizontal and must face the true south in BANGLADESH. IV. The average efficiency of PV module should be minimum 17%. V. The complete PV module shall be diode protected at junction box to protect reverse current. VI. Operating temperature range should be -40 to 85 Degree Celsius. VII. Power de-rating allowed should be not more than (-0.41%)/Degree Celsius VIII. Panels should be constructed with anti-reflective glass, anti Potential Induced Degradation(PID), IEC 61701 IX. Modules fitted with anodized aluminum frames or, if without frame, two-glass modules. X. Resistance to a maximum pressure load of 5400 Pa and vacuum of 2400 Pa (according to BDS IEC 61215)					

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	XI. Each module will be provided with a clearly visible identifier bearing the name, the model of the module and a visual identification or a serial number which allows the traceability of the date of manufacture in accordance with standard NF EN 50380 XII. Each combiner box of PV module shall be diode protected to ensure any back flow current to the PV array and may have fuse of adequate ratings in DC positive line of the PV array and wire terminals. The main combiner box shall have lightning surge protective device of as per nominal voltage of the combiner box both in positive and negative line in order to ensure the bypass diode always function even in thunder storm. The fuse, if exists, shall also have disconnection switch .The box shall be completely water proof according to IP 68. XIII. Product warranty against manufacturing defects : minimum 12 years and their replacement during this period. XIV. Performance warranty: linear degradation, minimum 98% at 1 year, then linear with minimum 90% at 10 years, and 80% at 25 years Solar panel from Sunpro/Vikram/Saronic/Suntech/ULICA/Canadian Solar/JA Solar/Trina Solar/Longi or equivalent.					

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CHARGE CONTROLLER:

MPPT / PWM (Pulse Wave Modulator) solar charge controller shall be protected from:

I)Overcharge protection (adjustable)

II)Over discharge protection (for DC load and less than 200 Wp system)

III)Battery reverse current protection

IV)Overloading protection

V)Temperature compensated charging

VI)Short circuit protection

VII)Reverse polarity connection protection

VIII)Lightning induced surge current protection

Power consumption should be less than 20 mw.

The controller should be microprocessor controlled with wide input range, cooling fan temperature compensation (-3 to 7mV / cell / Celsius), more than one-step charging to provide quick and safe charging for battery, 7 modes timer control (on / off DC load) selectable, automatic etc. as required.

IX.Power conversion efficiency: 90%

INVERTER:

The Inverter is specially designed for DC to AC power which provides pure sine wave. Supplier is allowed to use Off Grid Inverter for designing the system keeping in mind that, utility grid cannot be used for battery charging, they may use battery bank for reference input.

The inverter(s) shall comply with the following requirements:

I. Adopt power frequency transformed, pure sine wave output, adapt to different load.

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	II. Excellent protection design against output short circuit, working reliably. III. High inverting efficiency, energy saving and environmental protection. IV. LCD + LED display show the working status clearly. V. Design, manufacturing, performance, testing, safety, quality and environmental management shall be in accordance to the BDS IEC 62109/BS/VDE or equivalent international standards. VI. Should conform to ISO 9001, 14001 & 45001 standard. VII. The Inverter manufacturer shall have at least 05 (five) years of experience, nominal input voltage: 24/48V DC, output : 220V AC, output waveform : pure / modified sine wave, self consumption : less than 1 (one) watt, Efficiency : 97% or higher at operating load range from 10% to 100% rated load, Energy source : Priority to solar then battery. VIII. The Inverter shall be protected from lightning induced current by surge protective device of adequate rating both in DC and AC side in parallel at the entry and exit terminal of the inverter. The inverter shall also be protected for overload and over current protection from both DC and AC side. IX. Frequency ranges: 50-60 Hz, Relative humidity: 0- 95%, non-condensing, Operating temperature range: 0- 55°C, Cooling method: Natural Convention, Topology -Transformerless , Noise - <30dB , Protection – IP65. X. Brand: Solar Inverter from SAJ/Solis/Huawei or equivalent					
	BATTERY:					

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Solar suited Deep Cycle Lead Acid battery(12V)
Compliance : ISO9001 & ROHS (Restriction of Hazardous Substances) certified company.

ENERGY METER:

Supplying and installation of energy meters with following features:
I.Single phase / three phase (as per requirement)
II. Energy meter to be provided to record the amount of solar energy provided from the solar system.

GENERAL GUIDELINE/CRITERIA:

I. The bidder shall examine the site before the design of solar system & its components
II. The bidder shall have facilities and proper tools and machineries for installing, testing & commissioning of solar panel.
III. Adequate space & height shall be provided in the rows of panels for easy air flow to avoid excessive heat generation in the panel and to provide access for rain water drainage and damage to protect from dirty water. Minimum air gap between two panels shall be 25 mm.

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	IV.All frames of the PV module, combiner box, inverter etc. shall be equipotential bonded and earthed with the building earth electrode which is conventional and / or chemical electrode system with soil conductivity enhancing material that the earth resistance must be less than 1 Ohm as per related standard and code of practice. V. The solar panel mounting shall be of galvanized iron or equivalent to ensure rust protection of the installation. All nut bolts shall be of stainless steel (SS) or galvanized mild steel (MS) materials. VI. After successful completion, testing & commissioning of the whole system the contractor shall have to train nominated person(s) of the user for a period of at least 2 days. VII. After completion of whole system and before handing over the system to the concerned authority, the contractor must have to provide minimum 30 days' satisfactory operation for performance evaluation. VIII. Technical specification with catalogue of PV module, inverter must be submitted with technical offer. IX. Only approved cable shall be used for wiring. X. Sufficient AC and DC circuit breakers shall be used to ensure proper safety of the system.	kWp	176,910.00	176,910.00	176,910.00	176,910.00

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12.2	**ON - GRID SOLAR PANEL SYSTEM :** Supplying, installation, testing & commissioning of solar power system (on grid / grid tie) with required quantities of mono / poly crystalline silicon solar PV modules, inverter, energy meter, etc. as per following standards, specifications and certification. The system will be able to produce power for supplying to grid with required compatible solar cables (DC cables) and all necessary accessories to complete the installation providing one-year free operation & maintenance of the system. Solar system shall have to comply following specification:					
	SOLAR PV MODULE/PANEL: **SPECIFICATIONS FOR SOLAR PANEL:** I. Parameters for PV Panel should be at Standard Test Condition of solar irradiance of 1000 W/m^2, Cell Temperature of 25 degree Celsius and AM of 1.5g. II. Solar PV module / panel shall be inconformity with the requirement of BDS IEC 61215, IEC 61730 (latest edition) along with VDE/NEMA/JIS/BS standards. Certificate issued by the internationally recognized authority such as CE / TUV /DNV or equivalent certifying body shall have to be submitted by the bidder for the above mentioned international standard. Manufacturing facility should be ISO9001, ISO14001 quality management system certified.					

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	III. Solar panels shall be installed pointing to the right direction to capture most of the solar energy to transform it into electricity with the facility to be adjusted from the horizontal to 12 degree in summer and to 35 degree in winter to get the maximum efficiency and must face the true south in our country. For fixed panel mounting system, the panels must be tilted (22.5 ± 1) degree with horizontal and must face the true south in BANGLADESH. IV. The average efficiency of PV module should be minimum 17%. V. The complete PV module shall be diode protected at junction box to protect reverse current. VI. Operating temperature range should be -40 to 85 Degree Celsius. VII. Power de-rating allowed should be not more than (-0.41%)/Degree Celsius VIII. Panels should be constructed with anti-reflective glass,anti PID, IX. Modules fitted with anodized aluminum frames or, if without frame, two-glass modules.					

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	X. Resistance to a maximum pressure load of 5400 Pa and vacuum of 2400 Pa (according to BDS IEC 61215) XI. Each module will be provided with a clearly visible identifier bearing the name, the model of the module and a visual identification or a serial number which allows the traceability of the date of manufacture in accordance with standard NF EN 50380 XII. Each combiner box of PV module shall be diode protected to ensure any back flow current to the PV array and may have fuse of adequate ratings in DC positive line of the PV array and wire terminals. The main combiner box shall have lightning surge protective device of as per nominal voltage of the combiner box both in positive and negative line in order to ensure the bypass diode always function even in thunder storm. The fuse, if exists, shall also have disconnection switch .The box shall be completely water proof according to IP 68. XIII. Product warranty against manufacturing defects : minimum 12 years and their replacement during this period XIV. Performance warranty: linear degradation, minimum 98% at 1 year, then linear with minimum 90% at 10 years, and 80% at 25 years. Solar panel from Sunpro/Vikram/Saronic/Suntech/ULICA/Canadian Solar/JA Solar/Trina Solar/Longi or equivalent.					

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	INVERTER: The inverter shall be suitable for using on grid / grid tie solar panel. The inverter shall have following features: I. Inverter type: grid tie. II. Built in MPPT charge controller. III. AC grid voltage 230 ± 5% (single phase)/ 415v ± 5% (three phase) AC IV. AC grid frequency: 50±4 Hz V. Power factor: cosθ = 1. VI. Operating temperature range: -25°C to 60°C VII. Relative humidity: 0- 95%, non- condensing VIII. Total harmonic distortion : <3% IX. Efficiency: minimum 95% X. Noise <40 dB at 1m distance XI. Internal power consumption: <1 W for 1 kWp inverter XII. Communication port: RS 485 / RS 232 shall have the option to be incorporated with remote monitoring system. XIII. Degree of protection: according to IP65 and IEC 60529. XIV. Shall have integrated AC Short Circuit Current Protection XV. Shall have built in Anti Islanding protection XVI. Shall have protection against abnormal voltage and abnormal frequency. XVII. Shall have lightning induced current protection by surge protective device of adequate rating both in DC and AC side in parallel at the entry and exit terminal of the inverter. Shall also have over load and over current protection from both DC and AC side.					

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XVIII. Compliance: ISO9001 & ROHS (Restriction of Hazardous Substances) certified company.

XIX. Test result from BUET or Institute of Renewable Energy, Dhaka University for key specification items of solar inverter (self-consumption, efficiency, solar priority, dual mode with auto switching, power factor) shall be provided.

XX. Brand: Solar Inverter from SAJ/Solis/Huawei or equivalent

ENERGY METER:

Supplying and installation of energy meters with following features:

I. Single phase / three phase (as per requirement)

II. Energy meter to be provided to record the amount of solar energy provided from the solar system.

OPERATION AND MONITORING:

Following scopes should be included:

I. Remote monitoring (web / smart phone based) using available technology such as GSM/GPRS/Ethernet etc.

II. Local monitoring using LCD/LED display and data logger.

III. Field programmability

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	GENERAL GUIDELINES/CRITERIA: I.The bidder shall examine the site before the design of solar system & its components II.The bidder shall have facilities and proper tools and machineries for installing, testing & commissioning of solar panel. III.Adequate space & height shall be provided in the rows of panels for easy air flow to avoid excessive heat generation in the panel and to provide access for rain water drainage and damage to protect from dirty water. Minimum air gap between two panels shall be 25 mm. IV.All frames of the PV module, combiner box, inverter etc. shall be equipotential bonded and earthed with the building earth electrode which is conventional and / or chemical electrode system with soil conductivity enhancing material that the earth resistance must be less than 1 Ohm as per related standard and code of practice. V. The solar panel mounting shall be of galvanized iron or equivalent to ensure rust protection of the installation. All nut bolts shall be of stainless steel (SS) or galvanized mild steel (MS) materials. VI. After successful completion, testing & commissioning of the whole system the contractor shall have to train nominated person(s) of the user for a period of at least 2 days. VII. After completion of whole system and before handing over the system to the concerned authority, the contractor must have to provide minimum 30 days' satisfactory operation for performance evaluation. VIII. Technical specification with catalogue of PV module, inverter must be submitted with technical offer. IX. Only approved cable shall be used for wiring. X. Sufficient AC and DC circuit breakers shall be used to ensure proper safety of the system.	KWp	132,426.00	132,426.00	132,426.00	132,426.00

ANNEXURE-12

As per order no 27.052.031.00.00.001.2010-847, date 07.11.2010 of Ministry of Power, Energy and Mineral Resources, the requirement for solar power installation are as follow:

- In case of Electrical Load Demand less than or equal 2KW then no solar power is required.
- In case of residential building if electrical load demand is more than 2KW then the requirement of solar load demand is 3% of total load of the building or area.
- In case of Industrial and Commercial Building if electrical load demand is less than or equal to 50KW, then the requirement of solar load is 7% of only light and fan Load of that building or area.
- In case of Industrial and Commercial Building, if the electrical load demand is above 50KW then the solar load is 10% of only light and fan load of that building or area.
- In case of Garments Industry, the requirement of solar load is 5% of only light and fan Load of that building or area.