

PRE-QUALIFICATION DOCUMENT (PQD)

FOR

**PRE-QUALIFICATION OF FIRMS/ JOINT VENTURES AS
SUPPLY & SERVICE COMPANIES FOR INSTALLATION OF
SOLAR SYSTEMS FOR OPERATING HIGH EFFICIENCY
IRRIGATION SYSTEMS ON FARMERS' FIELDS**

UNDER

**PROMOTION OF HIGH VALUE AGRICULTURE THROUGH
SOLARIZATION OF DRIP & SPRINKLER IRRIGATION
SYSTEMS**



**DIRECTORATE GENERAL AGRICULTURE
(WATER MANAGEMENT) PUNJAB
21- DAVIS ROAD, LAHORE**

OCTOBER, 2019

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1. INTRODUCTION

Agriculture is a crucial driver of economic development in Punjab. It contributes a quarter to Punjab' GDP and about half of total provincial manpower depends on agriculture for their livelihood. Punjab is country's agricultural and economic heartland that contributes to about 80 percent of country's food requirements. More than 70 percent cropped area of the Pakistan's Indus food machine is situated in the Punjab and over 90 percent of province's agricultural production comes from irrigated lands. About two third of the population residing in rural areas rely directly or indirectly on this sector for their livelihood.

Despite critical significance of irrigated agriculture to national as well as provincial development, it could not perform sustainably mainly due to lack of modernization of agricultural operations leading to colossal loss of precious inputs resulting in low productivity.

Government of the Punjab is committed to revamp the agriculture sector to utilize its full potential to drive prosperity in the province for wellbeing of the farmers. Punjab Growth Strategy (PGS), 2018 envisions making a secure, economically vibrant, industrialized and knowledge-based province, which is prosperous and where every citizen can expect to lead a fulfilling life. PGS also envisages to enhance growth in agriculture by facilitating productivity improvement, increasing competitiveness in agriculture marketing & trade by providing a conducive climate for private sector investment, improving supply chain and value addition.

The Government of the Punjab has approved "Promotion of High Value Agriculture Through Solarization of Drip & Sprinkler Irrigation Systems". The project comprises of replacing conventional fuel for operating high efficiency irrigation systems sites with solar energy. "Promotion of High Value Agriculture through Solarization of Drip & Sprinkler Irrigation Systems" is one of such initiatives costing Rs.3.750 billion aimed at facilitating farmers to adopt high value agriculture. It envisages provision of 50% subsidy for installation of solar systems for operating high efficiency irrigation systems on 20,000 acres (installed under Punjab Irrigated-Agriculture Productivity Improvement Project).

2. PROJECT OBJECTIVES

The key objective of the project has been designed to maximize productivity of precious crop production inputs (water, fertilizer, energy etc.), besides enhancement in crop yields. The undertaking will have following key objectives.

- i) Reduce the operational cost of High Efficiency Irrigation Systems
- ii) Enhance crop and water productivity through optimal use of water and non-water inputs by application of modern irrigated agriculture development technologies.
- iii) Promote use of renewable energy in agriculture for promoting irrigated agriculture in remote areas.
- iv) Build farmers' capability at grassroots level for growing high value crops to get higher farm returns for alleviating poverty.
- v) Create job opportunities in rural areas through introduction of climate smart technologies for high value irrigated agriculture.

The proposed project objectives are consistent with overall objectives of the agriculture sector for increasing farm productivity, ensuring food security, reducing cultivation costs, enhancing farm returns, economic uplift of small farmers, and improving agricultural economy of the country as a whole.

3. KEY PROJECT COMPONENTS

The technologies under the proposed project will result in productivity enhancement, efficient resource management, crop diversification, better quality produce and promotion of environment friendly free energy source. Major activities to be carried out under the proposed project would include provision of Solar Systems to the farmers for operating High Efficiency Irrigation Systems on **20,000** acres.

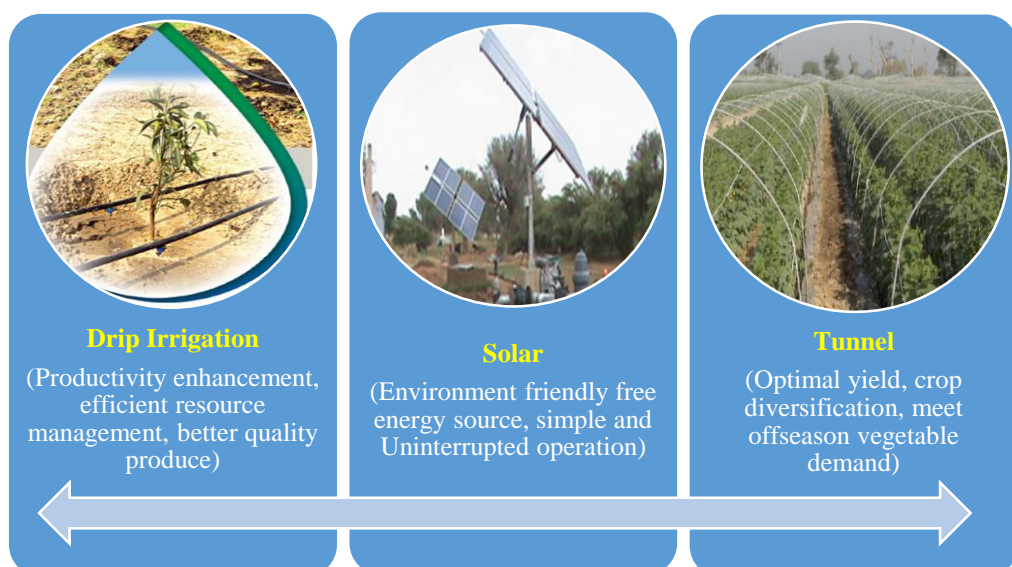


Figure-1: Climate Smart Technology Package

4. COST SHARING FOR PROVISION OF SOLAR SYSTEM

The government will provide **50 percent** of total solar system cost as subsidy and remaining **50 percent** will be borne by the participating farmers. This will encourage the farmers for adoption of this new intervention, which may result in greater demonstration effect for up-scaling the technology. The beneficiary farmers will also be responsible for operation and maintenance of installed systems.

5. PROVISION OF SOLAR SYSTEMS TO THE FARMERS ON HEIS SITES

Nature has blessed Pakistan with abundance of renewable energy resources, which have not been harnessed appropriately. Replacing or supplementing the conventional fuels for operating high efficiency irrigation system sites with solar energy seems workable option as sunlight is available for more than 300 days a year in Pakistan/ Punjab with about 8 hours effective daylight period. Most parts of the Punjab receive adequate solar radiation intensities over $5 \text{ Kw/m}^2/\text{day}$ (**Figure-2**). Its seasonal variations are also within acceptable limits. The arid/semi-arid climate of the Punjab, therefore, provides ideal conditions for adoption of solar energy for operating irrigation water pumps. Although solar is one of the renewable energy sources for pumping water but at the same time it has certain limitations in the form of high initial cost and non-availability of locally manufactured equipment.

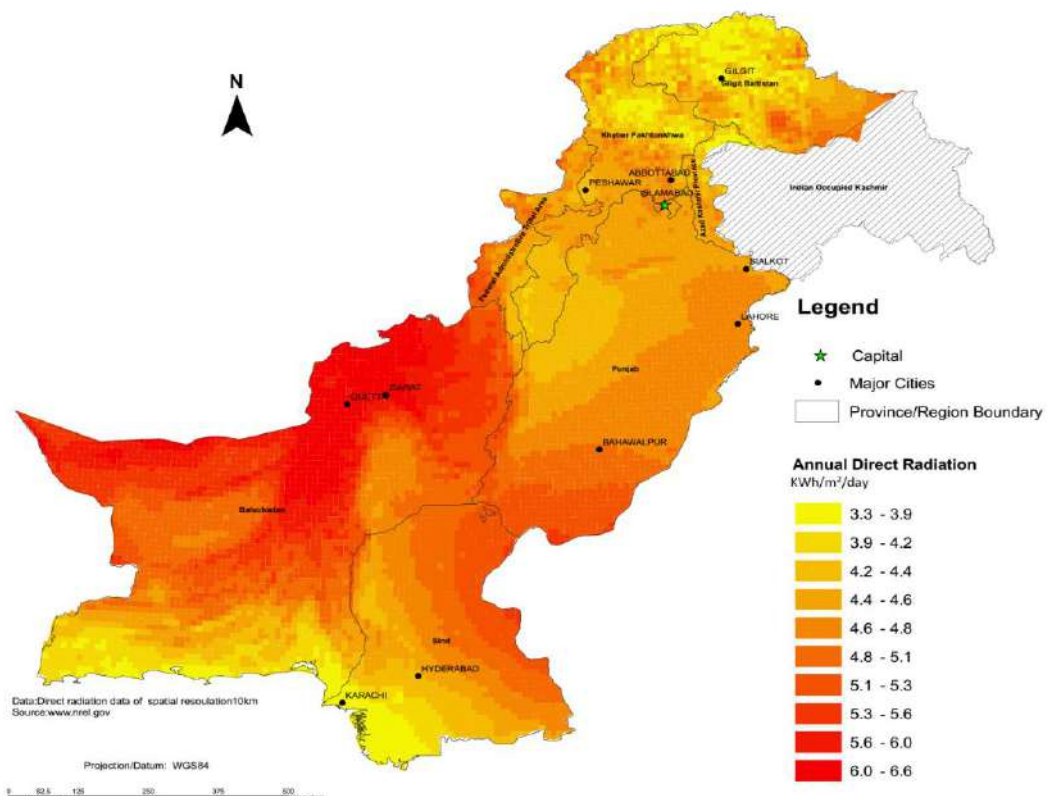


Figure-2: Prospects of Solar Radiation in Punjab

Presently, solar powered water pumps are globally restricted to applications where other energy sources are not feasible/available. The technology is advancing steadily, especially in the developing world like Asia and Africa. Its main uses have, however, been for drinking and small scale irrigation. The Indian government is subsidizing solar water pumping systems on a small scale for these purposes in few states like Rajasthan, Gujrat, and Haryana. Rajasthan government is currently providing subsidy for installation of solar tubewells in 16 districts for irrigating orchards & vegetables with drip system. Likewise, the government of Gujrat is subsidizing 500 solar water pumps to promote high-tech agriculture.

Similarly, in Pakistan, a few solar water pumps were installed by Thardeep Rural Development Program (TRDP) in Kasbo and Rarrkua villages of Nagarparkar district, which are being used to operate family drip systems for growing vegetables/fruits on 2-3 acres. Moreover, solar energy operated small size tubewells have been installed privately at few sites in Punjab for irrigation purposes. The Punjab Agriculture Department has also implemented a pilot scheme for testing of solar powered tubewells at nine (9) selected government farms. 2060 Solar systems for operation of High Efficiency Irrigation Systems were provided under the project "Promotion of High Value Agriculture through Promoting Climate Smart Technology Package". The above said experiences have revealed that although solar water pumping system has high initial cost but it is:

- ◆ system having trouble free operation once installed
- ◆ a reliable option, especially for remote areas, and;
- ◆ more effective if used with drip irrigation.

Use of solar energy for pumping water offers many advantages as compared to traditional paraphernalia such as a diesel engine or electricity operated tubewells/pumps. Solar water pumping system will have following advantages, with albeit some limitations. The major impediment is the low energy output (wattage) available with present affordable systems.

Advantages	Limitations
<ul style="list-style-type: none"> • Non-dependant on conventional energy (fuel and electricity) • Little maintenance • Easy to operate and maintain • Uninterrupted water supply for irrigation during day time • Potentially long panel life • Feasibility in remote areas • Environment friendly 	<ul style="list-style-type: none"> • High initial capital cost • Unfamiliar technology • Equipment economical for only low discharges • Actual economical life not yet established • Susceptible to theft and vandalism

It has, accordingly, been planned to install solar systems at suitable / selected HEIS sites for operating the HEIS to lift water from water storage ponds filled with canal/ groundwater and irrigating the crops with HEIS. Site specific direct coupling with groundwater and gravity systems may also be allowed in special circumstances. These arrangements will help to ensure timely availability of irrigation water for crops, particularly at their critical stages through uninterrupted water supply from solar units. It is indicated that subsidized standard solar system would have the capacity to irrigate upto 15 acres HEIS site by managing its irrigation frequency. The area under solar system would, therefore, be considered equal to HEIS acreage for reporting purpose. The concept has been illustrated in **Figure-3 and 4**.

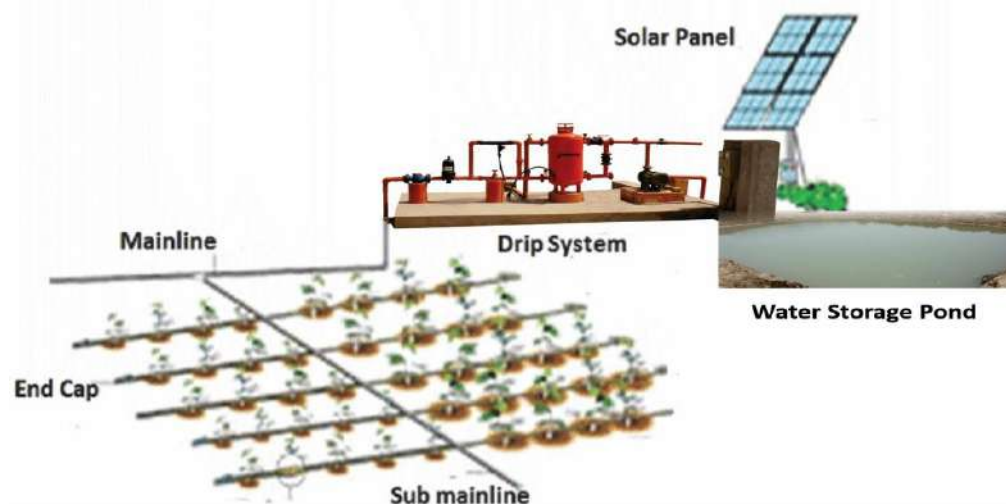


Figure-3: Typical Layout of Solar Powered Drip System (Storage Pond)

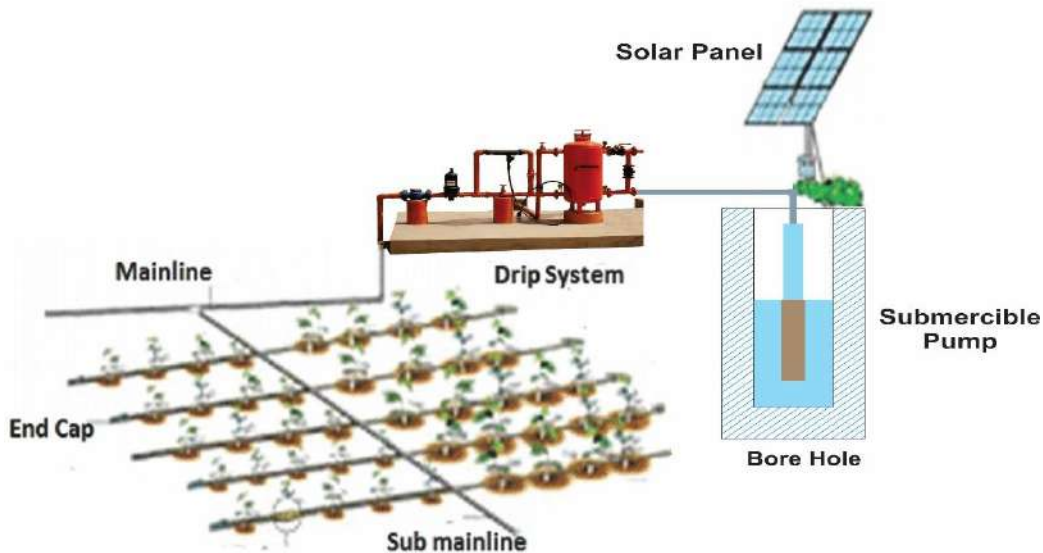


Figure-4: Typical Layout of Solar Powered Drip System (Direct Groundwater Pumping)

6. APPROVED IMPLEMENTATION PROCEDURE

- a) It has been planned to provide solar systems to the farmers who are willing/ have already installed HEIS under the proposed project.
- b) The department will pre-qualify the eligible supply & service companies (SSCs) for installation of solar system at HEIS site. Prequalification Committee (PQC) already constituted under the PIPIP will carry out these tasks and may co-opt additional members for assigned tasks. Agriculture Department may adopt already approved standards & specifications of solar equipment or may develop new specifications and get it standardized through specification standardization committee (**Annexure-A**).
- c) Applications will be submitted by the farmers individually on a prescribed application form and only one member of the family will be eligible. Application forms will be available in the office of Director Agriculture / Deputy Director Agriculture /Assistant Director Agriculture (OFWM) free of cost.
- d) The application will be accompanied by an affidavit containing following declarations for which necessary documents would also be attached to support the claims.
 - i) Canal/ rainwater stored in the water storage pond for drip irrigation.
 - ii) Farmer has installed or willing to install drip/ sprinkler irrigation system.
 - iii) The beneficiary is ready to contribute his share as per approved cost sharing formula as well as willing to bear post installation maintenance costs.
 - iv) Applicant is not a defaulter of any government organization or financial institution.
 - v) Applicant is willing to get requisite training in operation & maintenance of solar system.

- vi) The beneficiary farmer agrees to use solar system for operating HEIS only and will not use it for flood irrigation.
 - vii) The farmer will not sell/ transfer/ handover the solar system to any other person in any form within five years.
 - viii) The farmer will not alter the parts of the solar system to change the capacity/ power of the system.
 - ix) The applicant will pay back entire amount of subsidy in case of violation of terms and conditions of subsidy.
 - x) The farmer will be responsible for any physical damage/ theft and its rectification at his/ her own cost.
 - xi) The farmer will abide by all directions/ decisions of the department/ authority and will not challenge in any court of law.
- e) The applications will be scrutinized against approved criteria and eligible applicants will be advised to approach the pre-qualified SSC of their own choice for survey, design, and cost estimation of the solar system for operating drip/ sprinkler irrigation system.
- f) It will be ensured by the concerned DDA (OFWM) that the drip/ sprinkler irrigation system has already been installed/ being installed and/ or drip/ sprinkler system has been designed for its operation on solar systems before processing of case for solar system.
- g) The selected SSC will survey the site, prepare design, bill of quantity (BOQ), and cost estimates considering site specific power requirement (5.76 & 8.96 KW) for operating HEIS with water from water storage pond (Brackish groundwater and shallow watertable areas) or other sources. However, the ponds are not sustainable in some area especially in Thal area under undulated & sandy environment. Furthermore, there are deeper watertables beyond 100 feet in the Potohar region. In both scenarios, solar system of 10.4 KW would be provided for operation of HEIS for the promotion of high value agriculture and offered the same to the concerned DDA (OFWM/ project consultants for review and approval.
- h) The farmer, after approval of design and cost estimates, will be advised by the concerned DDA (OFWM) to deposit his/her entire share in the form of pay order/bank draft drawn in favor of selected SSC , which will be transmitted to Director General Agriculture (Water Management) Punjab alongwith requisite papers for issuance of work order.
- i) The work order will be issued by the DGA (WM)/ Project Director and SSC will be bound to deliver the solar equipment alongwith other accessories as per BOQs at site within the prescribed time frame mentioned in Tri-partite Agreement or work order.
- j) The delivered equipment will be inspected against approved specifications and BOQs by the project consultants as third party validation.
- k) After inspection of the delivered equipment, 50 percent of the system cost including pay order/ bank draft submitted by the farmer and remaining from the project funds will be paid by the DGA (WM) as 1st installment on recommendation of the consultants conveyed by concerned DDA (OFWM).

- l) The SSCs will complete the installation of solar system within prescribed time period after delivery/inspection of equipment. The installed system will be verified by the project consultants for its performance as per approved design and specifications.
- m) The consultants will ensure that coupling of solar system with drip/sprinkler irrigation system is according to the approved guidelines, compatibility, and performs successful operation of the HEIS.
- n) The performance of installed solar system will be evaluated in terms of operation, design and discharge efficiency etc. and solar system will be handed over by the SSC to the beneficiary farmers in the presence of consultants and departmental representatives. At the time of commissioning/ handing over the system, the SSCs would ensure that
 - i) farmer has been trained in operation & maintenance of the solar system;
 - ii) logbook has been provided to the farmer;
 - iii) O&M manual in Urdu has been provided to the farmer; and
 - iv) Warranty card of the equipment has been handed over to the farmer.
- o) On the recommendation of the project consultants conveyed through DA (OFWM)/ DDA(OFWM), DGA (WM) will make 40% payment to the SSC on commissioning/ handing over of the solar system to farmer (2nd installment) by keeping 10% as retention money, which will be released after two years on provision of satisfactory post-installation services for successful system operation.
- p) Concerned DDA (OFWM) will visit the site on monthly/ quarterly basis and submit the report to the DA (OFWM) and Director General Agriculture (Water Management) Punjab/ Project Director on performance/ any issue in the installed solar system.
- q) The SSCs will be bound to provide the post installation services for at least two years.

7. ELIGIBILITY CRITERIA FOR PREQUALIFICATION OF SUPPLY AND SERVICE COMPANIES

The firms/ joint ventures (having capacity to deliver the complete package of services including survey, design, supply of equipment/ materials, installation & commissioning and post installation back up support viz-a-viz operation & maintenance services for complete system) with the following strength/ background would be eligible for prequalification as SSCs for the project period, which will be renewed every year based on satisfactory performance.

- (i) The local firms are encouraged to make joint ventures with the foreign firms/principle. In case of joint venture of local firm with foreign principal, the experience of later elsewhere in the world may be considered. The joint venture agreement would be required for the purpose;

- (ii) If the applicant is consortium of firms, there must be a leading firm appointed through a Power of Attorney executed by all other consortium members;
- (iii) Must have an office in Pakistan preferably in the Punjab and have/ willing to establish at least three (3) sub-offices/ dealerships/ after sales service centers at divisional level in the province;
- (iv) Must be registered with Income Tax and Sales Tax Departments (Attach NTN & STN Registration Certificates supported by active NTN& STN alongwith complete returns for last three years);
- (v) Must be in business for last three years;
- (vi) Must have experience of completing similar assignments preferably installation of at least 10 solar powered water pumping systems during last three (03) years (Attach following documents to justify the experience claim):
 - *list of completed and on-going projects with location, components, size/scope, cost, period etc*
 - *List of Clients (Name, Address, Contact number, year of installation etc.)*
 - *Type of Solar systems installed*
 - *Any additional document to support relevant experience*
- (vii) Must possess inventory of solar equipment as per standards & specifications approved by the Punjab Agriculture Department to install solar systems for operating HEIS for 50 acres (provide list of inventory);
- (viii) Must have mix of professional staff including minimum two Electrical Engineers, two Agricultural Engineers, and five Solar Technicians (Provide list of staff and their CVs indicating qualifications, appointment letters, salary slips and their registration with professional institutions & relevant experience supported by relevant documents). The firm will also furnish undertaking to recruit the additional staff as per project requirements, if needed);
- (ix) Must have minimum average annual turnover of Rs. 3 million (Attach acceptable document like audited financial statements, tax declaration/ returns etc.);
- (x) Must be manufacturer or distributor or authorized dealer of specific make of solar systems meeting approved technical specifications of the Punjab Agriculture Department and must agree to supply compatible complete unit including PV panels and essential accessories (Attach valid sole distributor certificate, complete specifications of PV panels and required accessories alongwith origin certificate of equipment, brochure etc.);
- (xi) Must provide affidavit confirming that (a) applicant firm/ joint venture have never been blacklisted by any government department. (if ever black listed, then provide the case history, current status of the firm regarding this decision) (b) all the information provided by the applicant firm/ joint venture are correct (c) the firm will provide compatible solar equipment as per approved standards & specifications along with import documents (d) the firm will deploy staff as per project requirement/ directions of the Client; and
- (xii) Must attach pay order/ bank draft amounting to Rs. 10,000/- in the name of Director General Agriculture (Water Management) Punjab, Lahore as non-refundable processing fee for pre-qualification.

Duplicate Proposal (one original and one copy sealed in separate inner envelopes which must be put in one outer envelope) will be submitted in the

office of the Director General Agriculture (Water Management) Punjab, Lahore till 20 October, 2019 during office hours. The proposal should be in English language and all supporting documents must be in English or Urdu language. The documents must be arranged in the sequential orders according to above mentioned eligibility criteria and pages numbered properly. The proposals must be complete in all respect as the incomplete applications will be rejected being non-responsive. . A pre-qualification committee already constituted by the Agriculture Department will evaluate the proposals/ offers and decide about acceptance/ rejection of proposals. The interested firms/ JV may collect additional information and pre-qualification document (PQD) free of cost immediately from office of the undersigned or may download the same from OFWM website (www.ofwm.agripunjab.gov.pk). **A pre-proposal meeting to clarify the requirements for pre-qualification to be included in the proposals, will be organized on October 07, 2019 (Monday) at 10:00 am in the committee room of Directorate General Agriculture (Water Management) Punjab, 21-Davis Road, Lahore.**

PROPOSAL EVALUATION

The evaluation of proposals will be carried out on the basis of applicant firm(s)/joint venture(s) responsiveness to the eligibility criteria/ requirement. A Pre-Qualification Committee (PQC) already constituted by the Agriculture Department will evaluate the proposals and decide about acceptance/ rejection of the proposals. Any misinformation, false and forged statement will lead to disqualification from being shortlisted/ pre-qualified and any other action as per the applicable law.

8. PROPOSAL SUBMISSION

It is clarified that the SSCs previously prequalified for installation of solar systems under “Promotion of High Value Agriculture Through Provision of Climate Smart Technology Package” are also required to get prequalified afresh for this project

The proposals/ applications will be submitted in the office of Director General Agriculture (Water Management) Punjab, Lahore. The interested firms/ Joint Ventures may collect additional information and pre-qualification document from office of the undersigned.

Director General Agriculture (Water Management) Punjab
21-Agha Khan Soyyum (Davis) Road, Lahore, Pakistan
Tel: +92-42-99200703 Fax: +92-42-99200702
Email: pipipwm@gmail.com

Annexure-A


ANNEXURE-I(a)

TECHNICAL SPECIFICATION OF SOLAR PHOTOVOLTAIC MODULE

(Polycrystalline 60 cell series)

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	250 to 290-Watt Poly 60 cell series
2	Solar Cell	Polycrystalline silicon
3	Module Efficiency	≥15.5 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation).
9	Junction Box	PVC
10	Junction Box Standard	IP67 and above
11	Performance Warranty	25 years i.e, insurance backed warranty (Manufacturer warranty on letter head), global irrevocable and immediate insurance-backed with 3 rd party policy rights of operation. Performance warranty will be linear.
12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1 Manufacturer
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m2 (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

Specifications approved by CSSE on 29.09.2017


Senior Technical Officer
Purchase Cell Agriculture
Department Lahore. *Ar*

TECHNICAL SPECIFICATION OF SOLAR PHOTOVOLTAIC MODULE

(Polycrystalline 72 cell series)

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	300 to 360-Watt Poly 72 cell series
2	Solar Cell	Polycrystalline silicon
3	Module Efficiency	≥16 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)
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12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m ² (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

Specifications approved by CSSE on 29-09-2017



Amir Qadir
Senior Technical Officer
Purchase Cell Agriculture
Department Lahore. *Agr*

TECHNICAL SPECIFICATION OF SOLAR PHOTOVOLTAIC MODULE

(Monocrystalline 60 cell series)

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	250 to 290-Watt Mono 60 cell series
2	Solar Cell	Mono-crystalline silicon
3	Module Efficiency	≥16 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)
9	Junction Box	PVC
10	Junction Box Standard	IP67 and above
11	Performance Warranty	25 years i.e, insurance backed warranty (Manufacturer warranty on letter head), global irrevocable and immediate insurance-backed with 3 rd party policy rights of operation. Performance warranty will be linear.
12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m ² (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

Specifications approved by CSSE on 29-09-2017.


 Senior Technical Officer
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 Department Lahore. 

TECHNICAL SPECIFICATION OF SOLAR PHOTOVOLTAIC MODULE

(Monocrystalline 72 cell series)

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	300 to 360-Watt Mono 72 cell series
2	Solar Cell	Mono-crystalline silicon
3	Module Efficiency	≥16.75 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)
9	Junction Box	PVC
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11	Performance Warranty	25 years i.e, insurance backed warranty (Manufacturer warranty on letter head), global irrevocable and immediate insurance-backed with 3 rd party policy rights of operation. Performance warranty will be linear.
12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m ² (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

Specifications approved by ESSE on 29.09.2017.

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TECHNICAL SPECIFICATION OF PUMP CONTROLLER/VFD

Sr. No.	Item/Feature	Specification
1	Application	Converts D.C voltage to A.C voltage and regulates the functions of the pump
2	Standard Compliance	IP65 or above
3	Efficiency	≥95 %
4	Type	Wall mounted
5	Free warranty period	02 years from the date of certification including replacement and O&M service or more as provided by manufacturer
6	Built-in functions	Variable Frequency Drive. Automatic Start and Stop with any input power (solar, Grid and Generator). Self-diagnostic and self-Protection. Multi-string input with failure. Dry run protection detection. MPPT (Maximum Power Point Tracking).
7	Controls	Digital controls with complete protective functions. Instantaneous output status display (Speed / Power /Amps) etc. Intelligent Power module (IPM) with LED displays or external display through smart phone for operating system. Data logging (Optional). Ground fault monitoring. AC short circuit protection. Under/Over Voltage & Over Current protection. Low Voltage Disconnect (LVD). Overcharge Protection. Reverse Current Blocking.
8	Temperature range	-10° to + 60° Celsius
9	Rated output voltage	A.C and D.C rated voltage (single/three phase)/rated voltage matching with the motor.
10	Origin	Imported

Specifications approved by CSSC on 29-09-2017

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 Purchase Cell Agriculture
 Department Lahore. *Agri*

TECHNICAL SPECIFICATIONS OF SUBMERSIBLE PUMP SET

Sr No.	Items/Feature	Specification
Submersible Pump		
1	Materials	Impeller=AISI304, Housing= AISI304, Shaft= AISI304 (Stainless steel)
2	Specific Speed	2900 rpm
3	Pump set efficiency	Greater than or equal to 55%
4	Performance tolerance Standard	ISO9906
5	Quality assurance	Third Party inspection / Testing report
6	Origin	Imported / Local
7	Discharge	As per site Requirement
8	Head	As per site Requirement
Motor		
1	Type	Submersible Motor
2	Materials	Stainless steel
3	Rated Voltage	220-240/380-440 V
4	Voltage Tolerance	± 5% Volt
5	Phase	Single/three
6	Connection Standard	DIN/NEMA
7	Ingress Protection	IP68 totally against the powder /the effects of the submersion to precise conditions of pressure
8	Cooling Method	Water Cooled
9	No of Poles	Two
10	Frequency	50Hz
11	Thermal Protection	PT100
12	Operational suitability	VFD Supported
13	Origin	Imported / Local
14	Warranty	Minimum 02 years or more

All items/ products must be brand new with original packing

In case of DC Motors, built-in inverter is mandatory.

Specifications approved by esse on 29-09-2017.

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TECHNICAL SPECIFICATION OF CENTRIFUGAL PUMP

Sr. No.	Items/Feature	Specification
Centrifugal Pump		
1	Materials	Impeller=Cast Iron, Housing= Cast Iron, Shaft= Stainless steel
2	Specific Speed	2900 rpm
3	Performance tolerance Standard	ISO9906
4	PN Rating	PN16
5	Connection Standard	DIN/NEMA
6	Quality assurance	Third Party inspection / Testing report
7	Efficiency	Greater or equal to 60 %
8	Origin	Imported/Local
9	Discharge	As per site Requirement
10	Head	As per site Requirement
11	Warranty	Minimum 02 years or more

All items/ products must be brand new with original packing

Specifications approved by CSSC on 29-09-2017.


 Senior Technical Officer
 Purchase Cell Agriculture
 Department Lahore. Agr

TECHNICAL SPECIFICATION OF SURFACE MOTOR

Sr. No.	Items/Feature	Specification
Surface Motor		
1	Type	Surface Motor
2	Materials	Cast Iron/Aluminum
3	Specific Speed	2900 RPM
4	IE Efficiency	IE2 and above
5	Insulation Class	"F" The class F insulation system provides an exceptional margin of safety and ensures a longer thermal life even in abnormal operating conditions
6	Rated Voltage	220-240/380-440 V
7	Voltage Tolerance	± 5% V
8	Phase	Single/three
9	Ingress Protection	IP55 – Protection against the powder/Protect against water jets
10	Cooling Method	IC411 fan cooled
11	No of Poles	Two
12	IEC Standard	IEC 60034-30:2008/IEC 60034-2-1:2007
13	Operational suitability	VFD Supported
14	Frequency	50 Hz
15	Mounting	Foot Mounted
16	Efficiency	85% or more
17	Origin	Local/Imported
18	Warranty	Minimum 02 years or more

All items/ products must be brand new with original packing

Specifications approved by CSSE on 29-09-2017.




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TECHNICAL SPECIFICATION OF SOLAR ARRAY PANEL STRUCTURE

Sr. No	Item/Feature	Specification
1	Application	The structure carries solar modules straight to sunlight and provides manual tracking. 2 axis
2	Type	Ground mounted (Pole) with manual or automatic tracking
3	Material	Grade 60 Steel (for reinforcement of concrete only)
4	Galvanization	100 microns Hot Dipped Galvanization for mounting structure. All nuts and bolts installed to the whole structure must be of stainless steel. No drilling and cutting is allowed at site.
5	Quality Standard	ISO 9001
6	Wind bearing velocity	150 km/hr
7	Tracking options	Seasonal and daily variations
8	Civil Work	1:2:4 Concrete mixture (≥ 70 cubic.ft. for single pole having capacity to bear up to 3.4 KW solar array, maximum number of 10 panels on a pole). Base 5'x 5'x 1', Concrete block 3'x 3'x 5'. Shuttering of bricks/metallic for base and concrete block.
9	Top Structure	T-frame / middle pipe diameter 4", 3mm, 78 & 82 length with 2 angle adjusters of 3 holes. Side arms 2"x 2"x 5mm x 13feet or with horizontal pipe beams. Angle for PV adjustment 2"x2"x5mm, length depends upon panels or cam shaft provision for seasonal variations.
10	Base Plate	Base plate 15"x15", 16mm thickness with 4-arrays of 12"x4"x6mm thickness.
11	Main Pole	Main pipe diameter 5.5" (OD), 6mm thickness flange at 4 feet. 5-foot height. Flange with groove of 8mm with eight holes, with cap having 3mm thickness flange with 2 holes, with angle adjusters and pipe clips. Tracking of solar panels through groove surface (8 mm balls, 72 nos. minimum in groove). All nuts, bolts and other accessories to be of stainless steel. A piece of base plate equal to outer diameter of main pole will be removed and 360-degree welding of main pole to base plate will be done after fully inserting the main pole in the base plate.
12	Reinforcement Cage in civil work	4-J-bolts, 7/8" rod thickness, height 72", bend 06", 5 rings of 3/8" thickness, 12"x12" center to center
13	Warranty period	10 Years free
14	Anti-theft provisions	The mounting structure equipped with anti-theft screws/clamps to prevent removal of any element of the structure (optional)
15	Grounding & Earthing	The PV System and the entire structure shall be properly grounded according to Electricity Act of Pakistan. This is to ensure the requisite ohmic resistance and safety of the PV System along with connected electrical appliances.

Note: Structural Drawings are attached as minimum reference purposes as Appendix A. Minor variations are allowed subject to department's approval. In case major variations are required on site, the structural and mechanical drawings would be prepared by SSCs and afterwards these design parameters will be verified at site by the Dispute Resolution Committee.

Specifications approved by CSSC on 29.09.2017.


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TECHNICAL SPECIFICATION OF ELECTRICAL CABLES FOR SOLAR ARRAY WIRING

Sr. No	Item/Feature	Specification
1	Application	To carry current
2	Type	Single conductor type, 99.99% Copper, Cross-sectional area of 4 mm ² or higher, 1000 V / Class II (according to protection class II / 1000V, single core cable, tinned copper conductor, XLPE Insulation, double EVA jacket (resistant to heat and cold, resistant to ozone, UV, oil and chemicals), Temperature range: -40 to 90 ° C (Temperature Peak allowable: 120 ° C), Halogen free. DC cables shall be suitable for the environmental conditions at the Project site, including UV protection and rodent protection.
3	Color Coding	Positive: Red or brown. Negative: Black or blue
4	Cable losses	Ohmic losses less than 1% for DC cables and 0.5% for AC cables
5	Cable binders	Cable, cable binders, clamps and other fixing material must also be UV-resistant, made of polyethylene.

Specifications approved by ESSE on 29-09-2017.

MSR

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TECHNICAL SPECIFICATION OF POWER DISCONNECT (CIRCUIT BREAKERS AND BREAKER BOX)

Sr. No	Item/Feature	Specification
1	Application	To connect and disconnect the power and to enclose them in proper housing
2	Ingress Protection	IP 54 or higher for breaker box
3	Voltage	Have voltage ratings greater than the maximum circuit voltage
4	Current	Have current ratings between 125% and 150% of the maximum design current for the circuit
5	Display	All power disconnect should include a clear visual indication of their state (ON/OFF or I/O)
6	Alternate source switch over	There must be a switch over to power the pumping system with grid or generator on request of farmer

Specifications approved by CSSC on 29.09.2017.


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