PUNJAB RESILIENT AND INCLUSIVE AGRICULTURE TRANSFORMATION PROJECT (PRIAT)

INSTALLATION OF SOLAR SYSTEMS FOR OPERATING HIGH EFFICIENCY IRRIGATION SYSTEMS (HEISs)

ADDITIONAL INFORMATION PREQUALIFICATION DOCUMENT (PQD)

DIRECTORATE GENERAL AGRICULTURE (WATER MANAGEMENT) PUNJAB LAHORE

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INSTALLATION OF SOLAR SYSTEMS FOR OPERATING HIGH EFFICIENCY IRRIGATION SYSTEMS (HEISs)

1. PROJECT BRIEF

The World Bank assisted "Punjab Resilient and Inclusive Agriculture Transformation (PRIAT)" project was approved by the Executive Committee of the National Economic Council (ECNEC) on 07.10.2022 at a total cost of Rs.68,672.560 million for its implementation during five years (2022-23 to 2026-27) in the entire Punjab. The World Bank IDA financing is US$ 200 million/ SDR 148.8 million, whereas the Punjab Government counterpart share is Rs. 9,072.000 million, and farmers' contribution is Rs. 13,737.00 million.

2. OBJECTIVES

The Project Development Objective (PDO) of the project is "to enhance equitable access to, and productivity of, agricultural water, and improve incomes of farmers supported by the project".

i) Upgrade on-farm community irrigation conveyance network in canal and non-canal command areas to improve equitable access of water between head & tail-end farmers and improve water conveyance efficiency.

ii) Transform climate smart agriculture production systems through reformatory water management practices, renewable energy, regenerative agriculture, and high value agriculture technologies.

iii) Improve agriculture value chain through crop diversification, harvesting & value addition, and market integration.

iv) Strengthen private sector service delivery capacity for promotion of climate resilient high value profitable agriculture.

v) Develop capacity of stakeholders to adopt climate smart and high value agricultural practices for enhancing profitability and building resilience.

vi) Generate employment opportunities and green jobs to improve living standards and alleviate poverty in rural areas of the province

3. KEY COMPONENTS

i) Improvement of **1,000** unimproved watercourses

ii) Extension of lining on **2,000** partially improved watercourses.

iii) Reconstruction and extension of lining on **1,000** outlived watercourses

iv) Development of **3,000** irrigation schemes outside canal commands areas

v) Improving community water management (pilot test of water accounting & budgeting)

vi) Promotion of regenerative agriculture, crop diversification, harvesting, processing, agriculture value addition, and inclusive access to markets

vii) Installation of high efficiency irrigation systems (HEIS) on 40,000 acres

viii) **Installation of solar system for operating HEIS on 20,000 acres**

ix) Provision of certified orchard plants and vegetable seeds/ seedlings on **5,000** acres

x) Development of **1,000** on-farm water storage/ rainwater harvesting ponds

4. PROJECT LOCATION

Entire Punjab

5. GESTATION PERIOD

Five years (2022-23 to 2026-27)

6. INSTALLATION OF SOLAR SYSTEMS FOR OPERATING HEISs

The PRIAT will build upon the already developed model and support installation of solar systems on suitable/ selected sites for operating drip/ sprinkler irrigation systems to utilize water from water storage ponds filled with canal/ rain/ groundwater for irrigating the crops (Figure 1). This would help to ensure the timely availability of irrigation water for crops, particularly at their critical stages, through uninterrupted water supply from solar units. Site-specific direct coupling with groundwater and gravity systems may also be adopted in special circumstances based on technical feasibility.

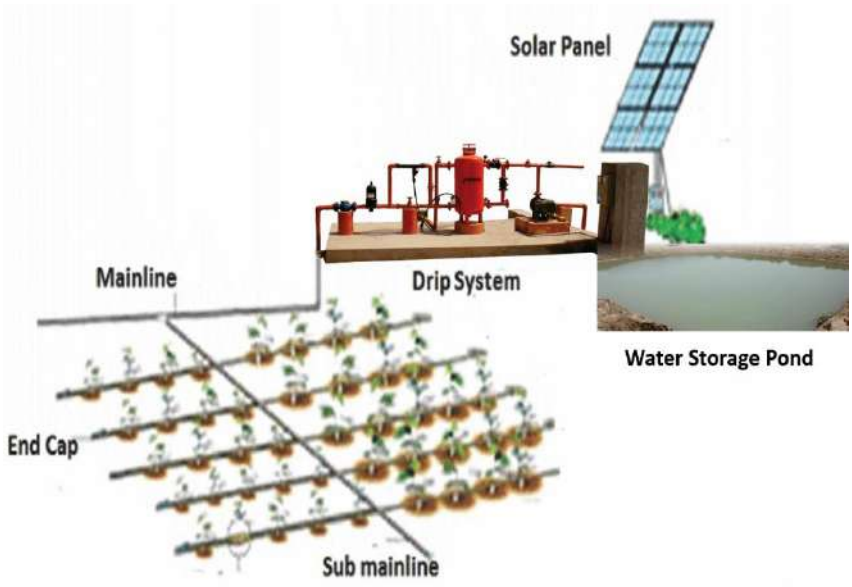

Figure **1**. Layout of solar powered drip system

6.1 Implementation Procedure for Solar Systems

a) Agriculture Department will allow already pre-qualified SSCs/ firms/ AOPs/ Sole proprietorship, etc. to work under the project and adopt already approved standards & specifications. Meanwhile, standards & specifications of solar equipment may be improved/ updated and got approved from Departmental Specification Standardization Committee of Agriculture Department, if required.

b) Applications will be submitted by the farmers individually on a prescribed application form. An individual farmer will be eligible for subsidy for solar systems capable for operating HEIS on upto 12.5 acres. Application forms will be available in the office of DA (OFWM) / Deputy DDA(OFWM) /ADA (OFWM) free of cost.

c) 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 will be stored in the water storage pond for drip irrigation or other source of water e.g. groundwater where technically feasible etc.

   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 and is willing to bear post-installation operation & maintenance cost.

   iv) Applicant is not a defaulter of any government organization or financial institution (undertaking).

   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 pumping groundwater 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. The farmers especially those having small holdings may also join through a contract agreement to share the inverter for sustainable energy supply. Under such arrangements, the joining farmers will be eligible for financial assistance upto upper ceiling in each case.

   ix) The applicant will pay back entire amount of subsidy in case of violation of any terms & 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.

   xii) The farmer agrees to the conditions that if he is found using the solar system for unauthorized/ other than the intended project purpose he may be blacklisted for future subsidy program of the Agriculture Department/ government

d) 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.

e) The concerned DDA (OFWM)/ PIS&TPV Consultants will ensure 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.

f) The selected SSC will survey the site, prepare design, bill of quantity (BOQ), and cost estimates considering site-specific power requirement for operating HEIS with water from water storage pond or other sources (e.g. brackish groundwater and deep watertable areas). However, the ponds are not sustainable in some area especially in Thal region under undulated topography & sandy soils. Furthermore, there are deeper watertables in different regions of the Punjab. Therefore, in all scenarios, solar system to operate 10 hp motor would be provided for operation of HEIS for the promotion of high value agriculture to the individual farmer. The same will be offered to the concerned DDA (OFWM/ Project Consultants for review and approval.

g) The farmer, after approval of design & 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 favour of selected SSC/ in-kind material, which will be transmitted to DGA(WM) Punjab, Lahore/ PD-PRIAT alongwith requisite papers for issuance of the work order.

h) The work order will be issued by the DGA (WM) Punjab, Lahore/ PD- PRIAT and SSC will be bound to deliver the solar equipment alongwith other accessories as per BOQs at site within the prescribed timeframe mentioned in the Tri-partite Agreement or work order. Late delivery charges will be imposed on SSCs for the delay in delivery of equipment or installation of site. The SSC may, however, request for an extension in solar installation period based on sound justification and farmer readiness. The DGA(WM) Punjab, Lahore/ PD-PRIAT would be competent/ authorized to accord extension in the material dispatch/ completion period.

i) The delivered equipment will be inspected against approved specifications & BOQs by the project consultants as third-party validation.

j) After inspection of the delivered equipment and confirmation/ inspection by the PIS&TPV Consultants' Field Engineer that the solar equipment/ material has been shifted to the site, 40 percent of the total system cost will be paid by DGA (WM) Punjab, Lahore/ PD-PRIAT as 1st instalment on recommendation by concerned DA/ DDA/ ADA (OFWM).

k) The SSCs will complete the installation of solar system within prescribed time period mentioned in the work order after delivery/inspection of equipment. The installed system will be verified by the PIS&TPV Consultants for its performance as per approved design and specifications.

l) The PIS&TPV Consultants will ensure that coupling of solar system with drip/ sprinkler irrigation system is according to the approved design, guidelines, compatibility, and successful in operation of the HEIS.

m) The performance of installed solar system will be evaluated in terms of design and operation, etc. and solar system will be handed over by the SSC to the beneficiary farmers in the presence of PIS&TPV 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.

n) On the recommendation of PIS&TPV Consultants conveyed through DA/ DDA/ ADA (OFWM), DGA (WM) Punjab, Lahore/ PD-PRIAT will make 50% payment to the SSC on commissioning/ handing over of the solar system to farmer (2nd instalment) by keeping 10% as retention money/ performance guaranty, which will be released after two years on provision of satisfactory post-installation services for successful system operation.

o) 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/ PD-PRIAT on performance/ any issue in the installed solar system.

p) The SSCs will be bound to provide the post-installation services for at least two years.

6.2 Scope of Work for Solar System

The project envisages installation of solar systems on **20,000 acres** (about 2,000 sites) at farmers' fields all over the Punjab.

6.3 Cost Sharing

The following sliding scale cost-sharing formula will be implemented for installation of solar systems for operating HEISs.

Acreage Slab	Govt. Share/ Subsidy	Farmers' Contribution
Upto 7.5 acres	75%	25%
7.6 to 12.5 acres	60%	40%

6.4 Specifications of Solar System

Solar Photovoltaic Module

Sr. No.	Item/Feature	Specifications	
	Application	To absorb the sunlight as a source of energy to generate electricity.	
1	Capacity	340 Watts and above	
2	Solar Cell	Monocrystalline Silicon	Polycrystalline Silicon

3	Module Efficiency	≥16 %	≥17 %
4	Power Tolerance	Positive Tolerance Only	
5	Operating Temperature	from -40° to +85° Celsius	
6	International Standards Compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification	
7	Identification	Barcode	
8	Labeling and 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	Juction 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 3rd 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 Co-efficient of Maximum Power (Pmax)	≤ -.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.	

Pump Controller/Variable Frequency Device (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 degree Celsius
9	Rated output voltage	A.C and D.C rated voltage (single/three phase)/rated voltage matching with the motor.
10	Origin	Imported

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 tracking
3	Material	Grade 60 Steel
4	Galvanization	100 microns Hot dipped Galvanization for mounting structure. All nuts and bolts installed to the whole structure must be of stainless steel or galvanized. No drilling or 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, with 8- 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 adjuster 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. The dimensions of top structure can be adjusted/changed depending upon the size of panel / array size, as per site requirement.
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-feet 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 grove surface (8 mm balls, 72 nos. minimum in groove). All nuts, bolts and other accessories to be rust resistant. 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 provision	The mounting structure equipped with anti-theft screws/clamps to prevent removal of any element of the structure (optional)
15	Grounding and 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 electric appliances.

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, linned copper conductor, XLPE insulation, double EVA jacket (resistant to heat and cold, resistant to heat and cold, resistant to ozone, UV, oil and chemicals), Temperature range:-40 to 90 ^{0}C (temperature peak allowable:120 ^{0}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.

Connectors and Power Disconnect

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

7. MAJOR ROLE OF SUPPLY AND SERVICE COMPANIES (SSCs)

i) Carry out field surveys using the latest tools

ii) Prepare designs in accordance with accepted standards & specifications

iii) Prepare cost estimates/ bill of quantities

iv) Install drip/ sprinkler irrigation systems at farmers' fields

v) Provide post-installation engineering and agronomic backup support services for at least two years

8. SUBMISSION OF REOIs

Applicant firms are requested to provide only relevant and complete information specific to the proposed assignment and avoid submitting generic promotional literature. Incomplete/ irrelevant/ generic information will not be considered. Any misinformation, false and forged statements will lead to disqualification from pre-qualified and any other action as per applicable laws. The department reserves the right to withdraw this REoI at any time and interested firms are responsible for all costs incurred arising from or in relation to this request.

The REoIs containing eligibility criteria containing last date for submission of proposals has been published in newspapers. The proposals/ applications will be received in the office of undersigned at given address in written form during office hours. A Pre-Qualification Committee (PQC) will evaluate the proposals/ offers and decide about acceptance/ rejection of proposals/ offers. For further details/ pre-qualification information/ clarifications, the firm(s)/ Joint Venture(s) can contact office of the undersigned within office hours.

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