LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT

PUNJAB CITIES PROGRAM (PCP)

PC-I FORM

FOR

SOLARIZATION OF TUBEWELLS AND DISPOSAL STATIONS

IN

KHANEWAL CITY

Estimated Cost. Rs 117.631 M

July 2023

MUNICIPAL COMMITTEE KHANEWAL

PC-I FORM FOR

SOLARIZATION OF TUBEWELLS AND DISPOSAL STATIONS IN KHANEWAL CITY

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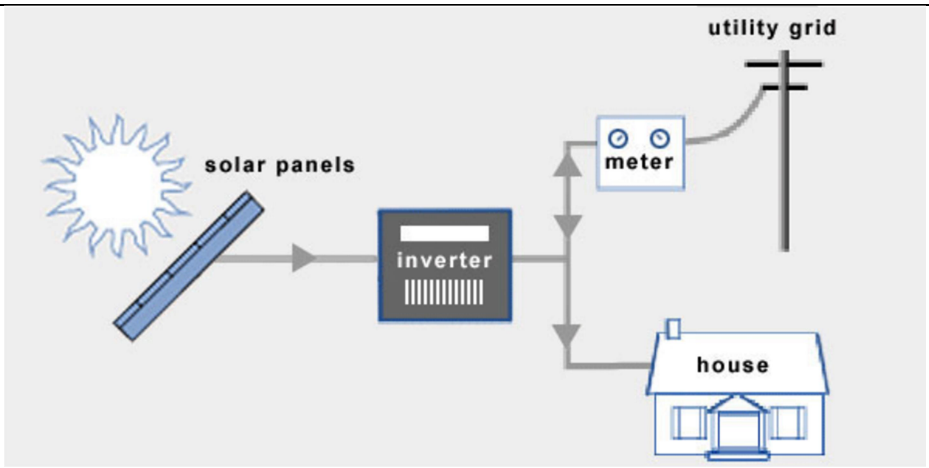
Project Serial Number
Sector : Infrastructure
Sub Sector: Energy

<table>
<tr><td>1. Name of the Project</td><td>SOLARIZATION OF TUBEWELLS AND DISPOSAL STATIONS IN KHANEWAL CITY</td></tr>
<tr><td>2. Location</td><td>Khanewal is located at 298 Km in south west of Lahore and at a distance of 45 Km in North East of Multan. The city coordinates are 30° 17' 11.0940" North latitude, and 71° 55' 55.3080" East longitude.
Location map of the city is attached in Annexure-A</td></tr>
<tr><td colspan="2">3. Authorities Responsible for</td></tr>
<tr><td>i- Sponsoring</td><td>Government of the Punjab (through World Bank Funding)</td></tr>
<tr><td>ii- Execution</td><td>Municipal Committee Khanewal</td></tr>
<tr><td>iii- Operation and Maintenance</td><td>Municipal Committee Khanewal</td></tr>
<tr><td>iv-Concerned Provincial Department</td><td>Local Government and Community Development Department Punjab</td></tr>
<tr><td>4a. Plan Provision</td><td></td></tr>
<tr><td>i. If the project is included in medium term/five-year plan, specify actual allocation</td><td>Punjab Cities Program (PCP) is a World Bank Funded Program with a total cost of 236.00 million USD and comprises of below mentioned components.
<table>
<tr><td>Total loan from World Bank</td><td>200 million USD</td></tr>
<tr><td>Component-1 Infrastructure Development (P for R)</td><td>180 million USD</td></tr>
<tr><td>Component-2 Technical Assistance</td><td>20 million USD</td></tr>
<tr><td>MCs share (20% of P for R component):</td><td>36 million USD</td></tr>
<tr><td>Total Program’s cost</td><td>236 million USD</td></tr>
</table></td></tr>
<tr><td>ii- If not included in the current plan, what warrants</td><td></td></tr>
</table>

its inclusion and how it is now proposed to be accommodated	Not applicable
iii If the project is proposed to be financed out of block provision indicate.	The Project is being financed by World Bank as Donor along with 20% co-financing from the Program Municipal Committees and is not proposed to be financed out of Block Allocation.
4b- Provision in the current year PSDP/ADP	The project is included in the Punjab Cities Program which is reflected in ADP 2023-24 at General Serial No-1673 with provision of Rs 537.66 million as Technical Assistance Component
5. Project objectives and its relationship with sector objectives	From the recent Past the energy crisis is adversely affecting the life of the common lot. The Federal Government and Provincial Government are extending all priority to the energy sector to enhance production but due to restrained economy the total potential especially in hydroelectricity could not be undertaken by the Government. Under the situation PMDFC is exploring alternate energy options such as solar. To address the issue of non-availability / totally unreliable and expensive electricity in the Water Sector across all over the province PMDFC has proposed Solar Energy technology. The details related to the annual energy consumption and available roof/land space for Solar PV Generation Plant were collected. While carrying out the feasibility study all possible design tools / techniques have been adopted to initially assess the requirement of each site. Then the designed optimum solutions related to solar PV were verified while using the relevant software simulations and then the final Solar PV configurations was recommended based on one year energy profile extracted from energy meter readings etc.
6-Description, and justification, of Project	
i. Describe the project and indicate existing facilities in the area to justify the establishment of the project.	One of the major challenges in Pakistan is the energy crisis. In view of the prevailing energy crisis in the country resulting into excessive load shedding and low voltage, there is a need to look into the possibilities of using alternative energy sources, in particular carbon free energy like solar energy, wind energy and geothermal energy. Currently departments in Punjab are practicing use of electric energy from national grid, which is not only unreliable but is also extremely costly. PMDFC is cognizant of the energy situation in the country and intends to start use of alternate power sources, in particular the solar energy. Pakistan Geographical location and weather condition favors maximum sun light during the day and is ideal for solar energy production and use. Electricity is the basic operating key for services in almost all sectors of human life but due to the huge shortfall of electricity the solar electric system is considered the only viable solution. The project

		will provide a continuous flow of power supply to operate electrical motors which will further expedite the water supply and disposal station services without delay, so the ultimate benefits would be (i) Saving Electricity (ii) more independency and security (iii) Financial Savings (iv) The scheme will deliver socio-economic benefits to the community. It provides the community with better water and waste water infrastructure which will reduce the risk of urban flooding. There are certain merits and demerits of using both kinds of energy sources. The review of the comparison reveals that capital cost of solar energy system is more than the electric based energy cost, however the O&M cost of electric energy-based System is far more than the solar one. It can therefore be concluded that solar based technology is more economical on longer term basis.
ii.	Technical parameters i.e. input and output of the project. Also discuss technological aspect of the project.	**Input of the project Rs:** 117.631 million **Output of the project**: SOLARIZATION OF WATER SUPPLY AND DISPOSAL STATIONS OF KHANEWAL CITY **Outcome of the Project:** Continuous supply of energy, operationalization of electrical motors/equipment's, reduction in CO2, Reduction burden on national grid and favorable environment help the water disposal services effective and ultimately plays vital role in the improvement of water and sanitation services. **Technical Aspect:** The Grid interactive Roof Top mounted Solar Photo Voltaic system consists of mainly three (03) major components. The arrays of solar photovoltaic (SPV) modules, arrays mounting structure, the inverter or power conditioning unit(s) along with allied accessories. The Solar PV arrays convert the solar energy into DC electrical energy. The array mounting structure holds the PV modules in required position and the DC electrical energy is converted to AC power by the inverter or PCU, which is connected to the utility power grid and generator set for reference voltages in case of unavailability of national grid. The AC power output of the inverter is fed to the AC distribution board through metering panel and isolation panel. The 220 V AC output of the system can be synchronizing with the grid and the power can be exported to the national grid depending upon solar power generation and consumption of critical load. The following diagram shows a typical layout of a solar electric system:



With the Provision of Net Metering/Virtual Battery by NEPRA under SRO 892(I)2015, the excess energy specially when the water flow is less will be feed into the national Grid by reverse metering that will help the MC Khanewal to generate revenue or get adjustment in the monthly electricity bills.

iii. Detail of civil works, equipment & machinery, and other physical facilities

No substantial civil works or machinery is required for this project except small tools for fixing the solar panels.

Implementation of various components of project will be carried out through contractors, having complete equipment/ machinery and other physical facilities required for execution of the project. Procurement of machinery and equipment etc. would be made through hiring of Contractors as per PPRA rules.

Details of the Installations with recommended installed capacity is given below

Sr. No.	**Name of Installation**	**Recommended Capacity (Kw)**
1	Water Works Peoples Colony Khanewal	50 Kw
2	Main Disposal Works Tariq Road	165 Kw
3	Main Disposal Works Jahanian By Pass	140 Kw
4	Disposal Works Khanewal Kohna	35 Kw
5	Disposal Works People's Colony	20 Kw
6	Disposal Works Malik Abad	15 Kw
7	Main Disposal Works Tariq Road	20 Kw

<table>
<tr><td>iv Indicate governess issues of the sector relevant to the project and strategy to resolve them</td><td>• For smooth and efficient execution of the project, the work is divided into two phases for the Construction contract and Operations and Management period keeping in view the allocation of funds.
• The training program for the officers and field staff of MC is a mandatory requirement to provide satisfactory level of service delivery.</td></tr>
<tr><td colspan="2">7 SPECIFIC SECTOR INFORMATION</td></tr>
<tr><td>Detail description of major equipment, items and structure</td><td>(a) Solar PV Panels.
(b) Solar Inverters
(c) Cables /Wiring
(d) Protection Hardware.
(e) Smart energy Management and Remote Monitoring System
(PV Design and Cost is attached at Annex –B)
(Technical Specification attached at Annex – C)</td></tr>
<tr><td>Provide basis of design of the project</td><td>(a) Average Daily Insolation rate 5.25 kWh/m² i.e., Peak Sun Shine in Punjab.
(b) Last one Year Energy Profile.
(c) Roof / Ground Space</td></tr>
<tr><td>Indicate alternate technology along with selected one with justification</td><td>The existing mode of electricity in Khanewal is available through Multan Electric Supply Company (MEPCO). However, in order to ensure cheap & uninterrupted electrical source in absence of conventional electrification system solar based clean energy systems are proposed.</td></tr>
<tr><td>8- CAPITAL COST ESTIMATES</td><td>Pakistani Rupees 117.631 million
(Details are attached as Annex – B)
<table><tr><th>Ser</th><th>Description</th><th>Cost in Millions</th></tr><tr><td>1</td><td>Water Works Peoples Colony Khanewal</td><td>12.343</td></tr><tr><td>2</td><td>Main Disposal Works Tariq Road</td><td>40.733</td></tr><tr><td>3</td><td>Main Disposal Works Jahanian By Pass</td><td>34.561</td></tr><tr><td>4</td><td>Disposal Works Khanewal Kohna</td><td>8.64</td></tr></table></td></tr>
</table>

	5	Disposal Works People's Colony	4.937
	6	Disposal Works Malik Abad	3.703
	7	Disposal Works Nazim Abad	4.937
		Sub-Total	**109.856**
		Environment & Social Management Plan (ESMP) Implementation Cost	85,600
		Add 2% contingencies	2.197
		Add 5% PRA	5.493
		Total	**117.631**
Date of estimation of the Project Cost		July 2023	
Basis of determining the capital cost to be provided.		Market Survey	
9- **Annual Operating and Maintenance Cost After Completion of the Project**		The proposed systems have expected life of more than 15 years hence no equipment replacement cost is sighted during 15 years. However, O&M for 1 year will be borne by the contractor as Defect Liability Period (DLP). After the completion of the DLP the O&M will be the responsibility of the MC Khanewal	
10 - DEMAND AND SUPPLY ANALYSIS			
Existing Capacity of services and its supply/demand		There is an issue of non-availability or totally unreliable electricity provided through conventional grid supplied electricity.	
Projected demand for 10 years.		Provisioning of Systems (Solar Energy System & Energy Efficiency Measures) in this scheme are carefully designed. Whereas the project analysis has been made for more than 15 years span, after completion of this scheme there will be no projected demand for 15 years.	
Capacity of the project being implemented in public/private sector. Supply-demand gap		On successful completion of this scheme supply demand gap of non-availability of grid electricity will be diminished with a cheaper electricity solution.	

<table>
<tr><td>Design capacity and output of the proposed project.</td><td>Design has been developed on the basis of site survey, Energy Determination of the site, availability of land space and budget allocation. To Provide the Electrical Energy at cheaper rate.</td></tr>
<tr><td colspan="2">11- Financial Plan and Mode of Financing</td></tr>
<tr><td>Sources of financing
<u>Debt</u>
a) Indicate the local and foreign debt Loan</td><td>Below given loan for the Punjab Cities Program has been funded by World Bank for 16 PCP cities in Punjab.
<table>
<tr><td>Total loan to Government of Pakistan/Punjab</td><td>200 million USD</td></tr>
<tr><td>Component-1 for Infrastructure Development</td><td>180 million USD</td></tr>
<tr><td>Component-2 for Investment Project Financing For capacity building of MCs & three Govt. organization and program management.</td><td>20 million USD</td></tr>
<tr><td>20% share of Municipalities is equivalent</td><td>36 million USD</td></tr>
<tr><td>Total funds available for Infrastructure Development</td><td>216 million USD</td></tr>
<tr><td colspan="2">This project will be funded under this financing</td></tr>
</table></td></tr>
<tr><td>b) Equity</td><td>A. Loan /Grant to MC
The amount of loan converted to grant to Khanewal City will be Rs 94.105 million. The financing of the project will be as given below:
<table>
<tr><td>Grant to Unit for the year 2023-24
(80% of cost of PC-I)</td><td>PKR 94.105 million</td></tr>
<tr><td>20% Co-finance by MC
(20% of the cost of PC-I)</td><td>PKR 23.526 million</td></tr>
<tr><td>Total available funds
(Total cost of PC-I)</td><td>PKR 117.631 million</td></tr>
</table>
B. Project Cost: Rs 117.631 million
*The loan is from World Bank to Government of Pakistan/Punjab, which will trickle down to MC Khanewal as grant.</td></tr>
<tr><td>c) Grants</td><td>No grant is being given by Government of Punjab out of ADP funds. The World Bank loan to Government of Pakistan / Punjab will trickle down as grant to MC Khanewal</td></tr>
<tr><td>d) Weighted cost of capital</td><td>Nil</td></tr>
<tr><td colspan="2">12 - BENEFITS OF THE PROJECT AND ANALYSIS</td></tr>
<tr><td>A. Quantifiable Benefits
B. Non-Quantifiable Benefits
a. Socio – economic impact of</td><td>• Promoting the use of solar energy in the community welfare as a whole benefit the community in many ways. The advantages of making people more aware of how they can contribute to the well-being of the environment are just as valuable as the financial benefits, perhaps even more so because the long-term benefits of solar energy as a whole mean that we all ultimately benefit.
• MC Khanewal is facing a financial crunch where it is hard for them to</td></tr>
</table>

the project		meet their expenditures. As the electricity costs are rising, cost of electricity is one of the Current Budgeted costs for Electricity Bills of Disposal stations and tube well is 42.50 million. Installation of PV panels will produce electricity worth 37.1 million. It will take the MC out of its financial difficulties. • Electric bills can be substantially less in comparison to the use of energy generated from fossil fuels. Over an extended period of time the financial difference of cheaper electric bills can become quite significant, enabling government to inject more of their money into the economy. • Provisioning of uninterrupted solar based electricity will facilitate the operations of disposal stations and tube wells run without any interruption. • Provision of electricity through alternate energy to the tube wells and disposal stations will enable the MC Khanewal to deliver services at the most optimal level. • There is no land acquisition or resettlement requirement as the proposed structures will be constructed on land owned by MC Khanewal. • Reduction of public frustration • Improvement in local economy
i. Environmental Impact negative/positive		• The recommended solar PV systems produce no emissions and results in cleaner air and water for all. Using solar energy produces no air or water pollution and no greenhouse gases. Solar energy is predictable and is most efficient considering current utility rates. • In Pakistan, factories that burn fossil fuels to generate energy and power for homes and commercial sector rely on oil to generate the energy. As a result, Pakistan is dependent on oil that often comes from foreign nations to generate the electricity. However, if Pakistan adopt policies and implement more solar energy programs then, not as much oil would be needed in the country and thus the foreign currency reserve Pakistan spends on purchase of costly fuel from foreign nations would be reduced. • No environment threat is involved. In fact, the project is meant to promote clean energy technology. Energy efficiency, carbon dioxide emissions, and proportion of forest land cover are indicators of environmental sustainability of an area. Although the developing countries produce a fraction of the world's carbon emissions, they can play their role by reducing greenhouse gases by using renewable Energy Technologies. • Similarly, displaced greenhouse gas emissions carry significant global climate change benefits, towards which Pakistan has pledged action under the UN Framework Convention on Climate Change. (UNFCCC).

		Under UNFCCC, even every single LED home light can generate carbon credits per year. • When properly assessed for their externalities Renewable Energy (RE) options can become economically competitive with conventional supplies on a least-cost basis. • RE can thus supplement the pool of national energy supply options in Pakistan, expediting economic empowerment, security for a highly security place. Decentralized RE systems can also help reduce energy distribution losses and result in system-wide and national efficiency gains (e.g., as measured by energy intensity or energy use per unit of GDP). A growing renewable energy industry can afford new prospects for employment and business opportunities amongst local manufacturers and service providers. • Annual reduction of 812 MTCo2 shall be achieved from the generation of 640,800 KWhr units from Solar / Clean Energy.
Economic Benefits		(Discussed at **Annex D**)
Employment generation (Direct and indirect)		**<u>Employment Analysis</u>** **Direct Employment** ***a) Planning and Design of projects*** The planning and design of the project has been done in house by PMDFC who have appointed staff and experts in infrastructure and related disciplines along with their support staff. The same PMDFC staff will also provide supervision of the project to verify and certify the items of works to be executed under this PC-I. **b) Execution of the Project** ***a) PMDFC*** PMDFC has the project monitoring and supervisory role and the company has enough experts and staff to complete this assignment. PMDFC has already deployed under mentioned staff for these projects: • Civil Engineers • Accounts, administration and audit personnel • Urban planners • GIS experts • Support staff like computer operators, vehicle drivers, office boys and guards. • Procurement experts • Communication experts • Environmental and social experts • Contract management experts

		b) Municipality Khanewal MC has regular staff like engineers, sub engineers and other administrative & accounts keeping staff which will be responsible for execution of the project and contract management. No additional staff will be needed for execution of this project ***c) Contractor*** The contractor responsible for execution of the sub project will employ skilled and unskilled labor on this work. **Indirect Employment** • Indirect employment for production of material • The implementation of sub-projects will generate the jobs for operators, electricians, guards etc.
ii. Impacts of delays on project cost and viability		Delays in the project will cause cost over-run of the project. The sensitivity analysis table given in **Annexure-D** the net present value of the project will reduce if the delay causes the total cost of the project to rise by 10 percent.
12-Implementation Schedule		
a) Indicate starting and completion date of the project		From the Approval of the Project = 18 Months (6 Months Construction Phase + 12 Months O&M (DLP))
b) Item wise/year wise schedule in line chart		The Gant chart has been attached to **Annexure-E**
13- Management Structure and Manpower Requirements		
i. Administrative Arrangements for the Implementation of the Project		**i. Planning & design of the project** The project has been designed by PMDFC and it will also carry out the supervision of the project. **ii. Preparation of Cost Estimation** The cost estimates have been prepared by the PMDFC based on estimated quantities. **iii. Execution of the project** • The project will be executed by Municipal Committee Khanewal and supervised by PMDFC. The technical staff & experts in PMDFC will oversee, co-ordinate and collaborate in the project planning, design and implementation through their experts in head office located in Lahore and regional offices. The reporting of progress to LG & CDD & World bank and troubleshooting will also be the responsibility of PMDFC.

	• MO (I&S) of the municipal committee has been designated as Project Manager /Engineer in Charge of the project. The supervision of the works will also be carried out by these municipal officers along with their support engineering staff. All supervisory staff is available with MC. • The Procurement Committee of MC Khanewal will do the procurement of works and goods as per PPRA Rules. **iv. Verification of quantities included in PC-I** The works will be supervised by the PMDFC staff by assuring the quantity and quality of works. Payments will be made by the MC Khanewal after these contractor claims have been entered in the measurement books by the Project Manager/Engineer in Charge and pre audited as per LG Works Rules.
ii- The manpower requirements by skills during execution and operation of the project.	**a) PMDFC Experts and Staff** For rendering assistance in implementation of infrastructure projects in 16 MCs, PMDFC has the experts and staff in the required fields. In order to facilitate the Program Units, three regional offices have been established by PMDFC at Gujranwala, Faisalabad and Multan/Khanewal. **b) Contractor's Technical Staff, Skilled & Non skilled labor** The contractors will employ the supervisory technical staff and skilled & non skilled labor for execution of works. The works will be supervised by experienced Engineers and sub engineers and the number of slots for engineers and skilled and non-skilled will depend upon the type and quantity of work and its period of completion. Details of the staff requirement will be checked during bidding process as per the guidelines of PEC. **c) Repair & Maintenance of the Project** MC has its own regular staff which has been deployed for Repair and maintenance of the municipal services infrastructure. However, it has been observed that the existing staff is not adequate to repair and maintain the services in a manner which can give good service delivery. Hence it is proposed to; • Fill up the presently vacant slots • Recruit additional staff as per need of the infrastructure after obtaining the sanctions from the competent authorities.

14-Additional projects /decisions required to optimize the investment being undertaken	**Shortage & Frequent transfers of Provincially Appointed Staff** MC is facing shortage in provincially appointed and locally appointed cadres. This will seriously affect the pace of progress of the program and the implementation of the infrastructure projects may be delayed. Provincial Government should fill-up the vacant staff immediately for optimizing the investments and capacity building in MC.
15-Certificate	Certified that the project proposal has been prepared on the basis of guidelines provided by the Planning Commission for the preparation of PC-I for social sectors projects

Prepared by	PMDFC	Stamp & Signatures	

Checked by	Municipal Officer (Infrastructure) Municipal Committee Khanewal	Stamp & Signatures	
	Chief Officer Municipal Committee Khanewal	Stamp & Signatures	
Forwarded by	Administrator Municipal Committee Khanewal	Stamp & Signatures	