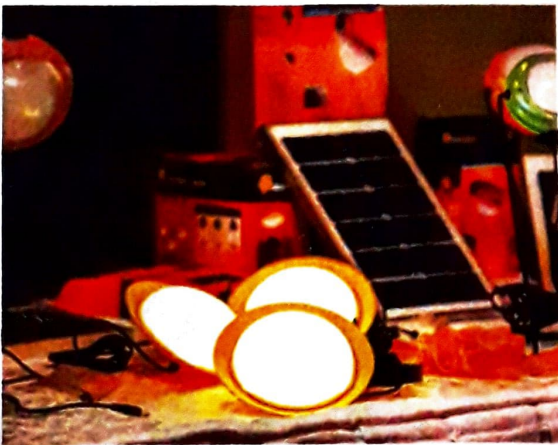


**GOVERNMENT OF SINDH
Directorate of Alternative Energy
ENERGY DEPARTMENT**

Modified PC-I

SINDH SOLAR ENERGY PROJECT (SSEP)
**Financed by the World Bank 96.57% and Government of
Sindh 3.43%**



January, 2019

GOVERNMENT OF SINDH
PLANNING & DEVELOPMENT DEPARTMENT

PC-1 FORM

(INFRASTRUCTURE SECTORS)
ENERGY (FUEL & POWER)

1.	Name of Project:	Sindh Solar Energy Project (SSEP) financed by the World Bank 96.57% and Government of Sindh 3.43%
2.	Location:	<ol style="list-style-type: none"> 1. Utility-Scale Solar: Initially 50 MW project at Manjhand near Khanot Grid Station, Taluka Manjhand, District Jamshoro (GPS coordinates for site outline: 25.768176°N, 68.264433°E; 25.758516°N, 68.264881°E; 25.758580°N, 68.273965°E; & 25.768007°N, 68.274047°E) will be developed by development of Solar Parks at locations to be identified through a comprehensive geospatial and grid capacity analysis. (Copies of Availability of Land and Minutes of Committee of Experts regarding allocation of 250 acres of land for 50 MW Solar Power Project at Manjhand are at Annexure A.) 2. Distributed Solar: Public sector buildings (schools, hospitals & administrative buildings) in Karachi, Hyderabad, and in other districts. Sites shall have detailed structural surveys carried out before being included in the Project, hence actual buildings will be identified and selected during project execution. 3. Solar Home Systems: Targeting areas with low or no electricity access in Sindh, prioritized according to two criteria: (i) Those with a high number of villages without grid electricity (no nearby transformer/distribution network); (ii) Those with a high number of villages with grid electricity but with low levels of reported electricity access i.e. high loss areas. (Detailed in PAD at Annexure B) 4. Technical Assistance & Capacity Building: Implementation support to Energy Department, Government of Sindh and other relevant entities

		in Government of Sindh. Not location specific. (Detailed in PAD at Annexure B)
3.	Authorities Responsible For:	
a.	Sponsor:	Energy Department, Government of Sindh
b.	Execution:	Directorate of Alternative Energy
c.	Operation and Maintenance:	<ol style="list-style-type: none"> 1. Utility Scale Solar. The Solar Park O&M is responsibility of Energy Department, Government of Sindh (via SPV); Solar Power Plant O&M is responsibility of qualified IPPs. 2. Distributed Solar. Solar power developer(s) responsible for O&M under long-term performance-based contract. 3. Solar Home Systems: Contractors responsible for all O&M under contract
d.	Concerned Federal Ministry:	Ministry of Energy (Power Division) and its allied agencies i.e. NTDC, AEDB, CPPA-G.
4.	Plan Provision:	
a.	If the project is included in the medium term/five-year plan, specify actual allocation:	<p>Project reflected at Sr. No. 609 in ADP 2017 – 18. Estimated cost of the project is US\$105 million, of which the World Bank share is \$100 million, and Government of Sindh share is \$5 million.</p> <p>Allocation for the year 2017 – 18 is Rs.580 Million.</p>
b.	If not included in the current Plan, how is it now proposed to be accommodated?	N/A

c.	If the project is proposed to be financed out of block provision for a program, indicate:	N/A
5.	Project Objectives, Description, Justification, Technical Parameters And Technology Transfer Aspects:	
a.	Project Objectives	The Development Objective is to increase solar power generation and access green energy in Sindh Province.
b.	Project Description:	<p>The Program Development Objective is to support the scale-up of solar power in Sindh Province and increase access to electricity. Further details of the project are at Annexure C.</p> <p>The Project was considered in PRE-CDWP meeting on 17.4.2018 (minutes of the meeting are at Annexure D1) and in light of the decisions of PRE-CDWP the para wise replies on the observations raised in the working paper of the meeting was submitted on 25.4.2018 (Annexure D2) and feasibility studies were submitted on 22.5.2018 (Annexure D3 & softcopies of Feasibility study reports of 50 MW Solar PV Power Project are attached as CD)</p> <p>The Project was then considered in CDWP on 2.5.2018 in which a Review Committee was constituted under Member (Energy) to address the highlighted issues of power evacuation, project design and feasibility studies (minutes at Annexure D4).</p>

		<p>The Review meeting was held on 15.5.2018 where all stakeholders including HESCO, SEPCO, CPPA and AEDB reached consensus to support the project subject to compliance with the prevalent framework for approval of solar power project in the country (minutes at Annexure D5)</p> <p>2nd Meeting of CDWP was held on 24.5.2018 where the project was recommended at a total cost of Rs.11440.21 Million including FEC of Rs.6545.00 Million for consideration of the ECNEC (Minutes at Annexure D6)</p> <p>The ECNEC in its meeting held on 14.11.2018 approved the project at an updated cost of Rs.12,848.11 Million including FEC of Rs.7,952.90 Million (1US\$ = Rs. 124.08) (minutes at Annexure D7)</p>
b.	<p>Project Justification:</p>	<p>27% of the population do not have access to electricity (Report on National Action Plan Sustainable Energy for All, January 2018 by UNDP and Ministry of Planning Development & Reform, Govt. of Pakistan). Resulting in poor socio-economic conditions and unavailability of health and education facilities. There is a strong justification for scaling up solar power in Sindh specially in remote areas where the cost of grid infrastructure is high and uneconomical. Due to recent international cost reductions in solar the deployment of solar PV systems is more feasible. The project will improve energy security, and fulfil Pakistan's international commitments on climate change. Furthermore, net metering facility will</p>

		provide a relief to the overloaded urban grid systems through roof top solar program. Further details are at Annexure E.
c.	Technical Parameters:	In Sindh, annual average Global Tilted Irradiance (GTI) ranges from around 5.7 to 6.4 kWhr/m ² /day (source: Global Solar Atlas). As a result of this excellent solar potential, solar power can be a least cost form of electricity generation, especially when project development risks are reduced through Solar Parks. Further details are at Annexure F.
d.	Technology Transfer Aspect:	<p>This project will lead to introduction of new technologies and business models to Pakistan, including state of the art solar power and plant control systems under Components 1 and 2, and Solar Home Systems (SHS) that meet the needs of populations in remote areas under Component 3.</p> <p>There will be substantial opportunities for technology transfer through joint ventures with local entrepreneurs. There will also be direct job opportunities created under the Project, a large percentage of which will be permanent new jobs in the renewable energy sector. This will increase the socio-economic development opportunities to the dwellers of remote areas.</p> <p>The project also includes a substantial capacity building program, including training for project staff and other stakeholders. The World Bank has also secured grant funds for technical assistance activities at the national level, including training and study tours of Directorate of Alternative Energy, Energy Department, Planning & Development Department, Government of Sindh and</p>

		other key agencies such as AEDB, CPPA-G, Ministry of Energy, NTDC, and Planning Commission.
e.	Inputs and Outputs of the Project:	<p>Inputs: US\$105 million shall be committed to the Project, of which \$95 million shall be for the investment components (Component 1-3), \$5m for capacity building and technical assistance (Component 4), and \$5 million for establishment of PMU staffing and other costs (Administrative Budget). Of the total budget of \$105 million, the World Bank shall provide \$100 million in the form of concessional loan financing (covering Components 1-4), and Government of Sindh shall provide \$5 million (to cover the PMU costs). The World Bank has also secured grant funds for technical assistance, which will be in addition to the project cost.</p> <p>Outputs:</p> <ol style="list-style-type: none"> i. Development of Solar Parks to support private sector investment under IPP mode, and launching of Pakistan's first competitive bidding for solar power production, starting with an initial 50 MW pilot solar auction (under NEPRA framework) at a site near Manjhand, district Jamshoro ii. Development of 20 MW of solar power on and around public buildings in Sindh province using competitively-awarded EPC contract and O&M. iii. Provision of Solar Home Systems to at least 200,000 households in Sindh (1.2 million people), by providing grants to households. iv. Capacity building and technical assistance activities to support the design implementation of the program and to learn state of the art solar PV

		technologies in practice in developed countries for electricity access.
f.	Provide details of civil works, equipment, machinery and physical facilities required for the project:	<p>Component 1: For development of Solar Parks, Government of Sindh will identify sites with Grid access and conduct various project development studies. (Letter regarding availability of land is at Annexure A)</p> <p>For development of the solar power plants, within the Solar Parks private sector IPP will be responsible for provision of all equipment and works.</p> <p>Component 2: For development of distributed solar on public buildings, equipment and necessary civils works, including solar panels and balance of system components will be carried out under an EPC contract with long-term O&M.</p> <p>Component 3: No civil works required, contractor will provide the Solar Home Systems to households. Solar Home Systems will comply with IEC standards or as deemed appropriate.</p>
g.	Indicate governance issues of the sector relevant to the project and strategy to resolve them:	<p>As per recent NEPRA decision on competitive bidding for renewable energy projects [NEPRA/LA(Leg.)/NCBT-01/6072], Government of Sindh is one of several "Relevant Agencies" for carrying out a competitive bidding process. Component 1 is designed to put competitive bidding into practice through a pilot solar auction on the 50 MW site, resulting in a new benchmark on both process and pricing and attracting private sector investment, including foreign direct investment (FDI).</p>

		<p>For distributed solar, there are few issues with implementing the net metering policy, due to uncertainties of the DISCOs on how it would impact them. Component 2 is designed to resolve such issues and potentially create a new model for implementing distributed generation, by first targeting buildings that do not require electricity export, and secondly by exploring a negotiated tariff settlement for exported electricity that may be mutually beneficial to Government of Sindh and the relevant DISCO(s).</p> <p>For solar home systems, it is important to ensure O&M procedures and arrangements so that the intervention is sustainable. Component 3 is designed to ensure O&M through selected bidders to provide O&M.</p> <p>Project will be executed through a Project Management Unit with World Bank support and fiduciary supervision. The World Bank brings to the Project international experience from other similar interventions, including on solar auctions, distributed generation, and solar home systems.</p>
6.	Capital Cost Estimates:	Rs.12848.11 Million
a.	Indicate date of estimation of project cost:	<p>February 19, 2018</p> <p>The Project cost has been updated in light of decision of the ECNEC meeting held on 14.11.2018 (minutes at Annexure D7)</p>

b.	Basis of determining the capital cost be provided. It includes survey, schedule rates, estimation on the basis of previous work etc.:	Capital cost for all components are estimated on the basis of market costs, or from previous NEPRA determinations where relevant.
c.	Provide year-wise estimation of physical activities as per following:	<p>Details of Government of Sindh activities/expenditures relating to the PMU establishment and staffing are provided at Annexure G. For the investment activities the Project will utilize World Bank lending.</p> <p>The Project cost has been updated in light of decision of the ECNEC meeting held on 14.11.2018 (minutes at Annexure D7)</p>
d.	Phasing of capital cost be worked out on the basis of each item of work as stated above and provide as per following:	For the investment activities the Project will utilize World Bank lending
Year wise breakup at Annexure H		
7.	Annual Operating And Maintenance Cost After Completion Of The Project	<p>Component 1: The operating cost (OPEX) for the solar power projects is estimated to be relatively low, at \$0.002/kWh, but will be covered by the IPPs (part of the bid tariff), and therefore not required.</p> <p>Component 2: After installation of the equipment necessary recurring costs involves contractor service</p>

		<p>charges for operation & maintenance services will be the part of contract and will be paid through project cost. The OPEX for distributed solar is estimated to be around 3% of the CAPEX value, and will be included in the EPC & O&M contract.</p> <p>Component 3: The OPEX for the solar home systems is assumed to be 10% of CAPEX, and will be covered under the contract for three years</p> <p>There is no OPEX cost under Component 4.</p>
8.	Demand and Supply Analysis:	N/A.
9.	Financial Plan and Mode of Financing:	<p>The Project has been designed with the lending support of the World Bank, and is being submitted for a \$100 million International Development Association (IDA) loan on concessional terms. The remaining \$5 million shall be contributed by Government of Sindh as 'counterpart funding', to cover the cost of the PMU. World Bank financing shall be disbursed to the PMU in accordance with World Bank procedures, and according to Project physical progress and achievements.</p>
a.	Equity:	3.43% (Government of Sindh Rs.440.11 million contribution to PMU staffing)
b.	Debt:	96.57% (World Bank concessional loan for \$100 million)
10.	Project Benefits and Analysis:	<p>The Project is expected to yield significant economic, financial and social benefits for Sindh. All of the Components deliver positive economic returns well above 12%.</p>

a.	Financial:	Financial benefits of the Project are provided at Annexure I
b.	Economic:	Economic benefits of the Project are provided at Annexure I
c.	Social Benefits with Indicators	<p>The Project will help to scale-up solar power in Sindh, and increase access to electricity especially among poorer communities. Specific targets and indicators are:</p> <ul style="list-style-type: none"> • Up to 415 MW of new solar power capacity facilitated (with an interim target of 50 MW); • 1,200,000 people will be provided with improved electricity access.
d.	Employment Generation (direct or indirect):	<p>Component 1: Direct employment generation in rural areas is expected through construction of Solar Parks, construction of the solar power projects (by IPPs), and long-term O&M.</p> <p>Component 2: Direct employment generation through construction and O&M of distributed solar facilities within Karachi and Hyderabad.</p> <p>Component 3: Direct employment generation in rural areas for installation and servicing solar home systems.</p> <p>All Components: Indirect employment generation in sectors supplying the solar PV market, such as provision of raw materials.</p>
e.	Environmental Impact:	<p>The installation of solar PV technology is a measure to reduce the GHG emissions produced through conventional fossil fuel power generation plants. The Project will have very minimal environmental impacts. Since the exact locations and nature of the sub-projects to be implemented under the Project are not known at</p>

		<p>this stage, a framework approach is being followed and Environmental and Social Management Framework (ESMF) has been prepared which highlights generic environmental impacts of the Project. At that time, site specific ESMPs will be also be prepared for each sub-project and disclosed appropriately. Component 1 is likely to cause air, soil, and water contamination, increase noise pollution, damage existing infrastructure, additional pressure on local resources particularly drinking water, environmental aspects of labor influx, loss of natural vegetation and habitat, and displacement of and disturbance to the wildlife. Most of these potential impacts are however low to moderate in intensity/significance and are reversible and localized in nature - and therefore can easily be mitigated with help of appropriate mitigation and control measures. Similarly, Component 2 can cause air, soil, and water contamination, noise generation, blockage of building access routes, damage to the buildings and other infrastructure, and water requirements during plant operation. Component 3 is likely to cause only minor environmental impacts including damage to houses and noise. Most of these impacts are mild in nature and intensity and can therefore be addressed through simple mitigation and precautionary measures.</p>
f.	<p>Impact of delays on project cost and viability:</p>	<p>The Project is designed as a five-year intervention to mitigate the impact of delays. It is anticipated that delays would not result in any cost increase or threat to Project viability, in part because the cost of solar power is gradually decreasing.</p>

11.	Implementation Schedule:	The project is expected to be implemented from the July 2018 i-e: FY 2018-19 after necessary approvals. The Project will be executed following approval of the World Bank loan. The project will be presented in the upcoming World Bank board expected in April 2018. A full implementation schedule is available at Annexure J .
12.	Management Structure And Manpower Requirements Including Specialized Skills During Construction And Operational Phases:	<p>A Project Management Unit ("PMU") will be established to implement and ensure completion of the Project under the control of Energy Department, Government of Sindh. Procurement, safeguards, and fiduciary controls, and related expenditures, will comply with the requirements and processes of the World Bank. The specific purpose of the PMU is as follows:</p> <ul style="list-style-type: none"> a. The PMU will be responsible for execution, implementation, monitoring and controlling of the project as per approved PC-I, and in line with the World Bank guidelines and procedures. b. Ensure the time, cost and scope of the project; c. Preparing status and progress reports and will update all the concern stakeholders regarding project status; d. Will deliver support to the stakeholders by providing guidance in project management processes and methodologies in an efficient and consistent manner; e. Providing necessary support and monitor and ensure the bidder/contractors performance for quality deliverables; f. Provide mentoring and assessing the performance of the project execution;

		<p>g. The PMU members will monitor and control the project and if in case of any change, if deemed necessary, the change request will be evaluated and recommended to the competent forum after assessing the financial impact.</p> <p>h. The PMU will be responsible for initiating the change request to the concern authorities. If change got approved then it will be communicated to all concern stakeholders;</p> <p>i. The scope of PMU is limited to the ongoing project.</p>						
a.	Justification:	<p>The purpose of the PMU is to control and execute the Project implementation activities and to ensure the progress in the project as per approved plan. The Project Director will head the PMU and be responsible for financial and physical progress of the Project. All matters related to the Project implementation will be monitored through a committee constituted by the Energy Department.</p>						
b.	Operating Cost of PMU:	<p>The operating cost of the PMU is detailed at Annexure G. This cost shall be fully covered by Government of Sindh as the 'counterpart funding' provided to the Project. The expenditures include staff salaries, purchase of auxiliaries, accommodation during field activities only, monitoring costs and any other costs deemed necessary for the project.</p>						
c.	Human Resource for PMU:	<p>Human resource requirement for managing the project is through PMU is as under:</p> <table border="1"> <thead> <tr> <th>S/No.</th><th>Title of Post</th><th>No. of Posts</th></tr> </thead> <tbody> <tr> <td> </td><td> </td><td> </td></tr> </tbody> </table>	S/No.	Title of Post	No. of Posts			
S/No.	Title of Post	No. of Posts						

1	Project Director (PPS-10)	1
2	Procurement Manager (PPS-9)	1
3	Accounting Officer (PPS-8)	1
4	Environment & Social Development Officer (PPS-8)	1
5	Admin Officer (PPS-7)	1
6	Officer Assistant (PPS-6)	1
7	Drivers (PPS-4)	4
8	Manager Utility Scale (PPS-9)	1
9	Manager Distributed Solar (PPS-9)	1
10	Manager Solar Home Systems (PPS-9)	1
11	Monitoring & Evaluation Specialist (PPS-9)	1
12	IT Database Manager (PPS-9)	1
13	Database Analyst (PPS-8)	1
Total		16

The posts proposed for the project are in accordance with the needs of the project while keeping in view the level and skills required for the successful execution of the project. The total number of staff which will be hired for this project is seventeen (17) and they will be hired on contract basis and further renewals on performance basis. TORs of project staff are at **Annexure K**. The staff salary structure is based on Standard Pay Package notified by Finance Department Government of Sindh vide No. FD (SR-III)5-29/2008(A) dated 21st September, 2017 (copy at **Annexure L**).

13.	Additional Projects/Decisions Required:	Following PC-1 approval, the World Bank loan will require separate approval through the standard processes of the World Bank, supported by Economic Affairs Division. The World Bank has already committed to the project at official level, so the final approval is at Board level. During implementation of the project, the competent authority may constitute committee(s) for any special purpose.
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14. Certificate

CERTIFIED THAT THE PROJECT PROPOSAL HAS BEEN PREPARED ON THE BASIS OF INSTRUCTIONS PROVIDED BY THE PLANNING COMMISSION FOR THE PREPARATION OF PC-I FOR INFRASTRUCTURE SECTOR (FUEL & ENERGY) PROJECTS:


Prepared by:



(IFTEKHAR AHMED)

Deputy Director (Off-Grid Solar)
Directorate of Alternative Energy
Energy Department
Government of Sindh

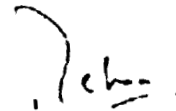
Checked by:



(ENGR. MEHFOOZ A QAZI)

Director Alternative Energy
Energy Department
Government of Sindh

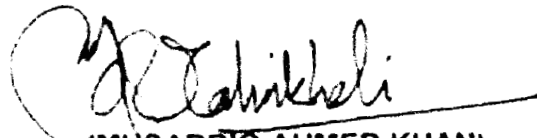
Recommended by:



(REHAN IQBAL BALOCH)

Additional Secretary (Admn)
Energy Department
Government of Sindh

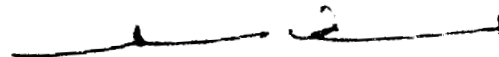
Approved by:



(MUSADDIQ AHMED KHAN)

Secretary to Government of Sindh
Energy Department

Countersigned by:



(MUHAMMAD WASEEM)

Chairman
Planning & Development Board

ANNEXURE A

AVAILABILITY OF LAND & MINUTES OF COMMITTEE OF EXPERTS MEETING



No. Wind Energy/ISO-VII/112/115
 GOVERNMENT OF SINDH
 LAND UTILIZATION DEPARTMENT
 Karachi, Dated: 27-07-2015

To,

The Assistant Director (Wind),
 Alternative Energy, Energy Department,
 Government of Sindh Karachi

SUBJECT: ALLOCATION OF THE LAND TO ENERGY DEPARTMENT FOR RENEWABLE ENERGY PARK IN VARIOUS DISTRICTS.

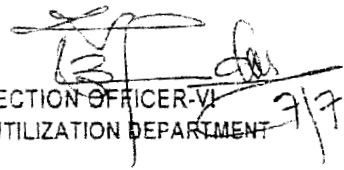
With reference to your office letter No. DAER/Min/ 29/2013 dated 25-03-2013 on the subject noted above.

I am directed to inform you that availability of state land in various districts furnished by the concerned Deputy Commissioners is as under:-

S. No	District	Land required (Acre)	Total Availability in acres	Details
1.	Larkkana	5000	Nil	Nil
2.	Sukkur	5000	5000	I. 5000/- Taluka Salehpat in shape of sandi dunes. Total (5000 acres)
3.	Sanghar	5000	5000	I. Two Desert Dens of Tanker Kripas Namely Rakon, Daler & Randhwa Total (5000 acres)
4.	Machar	5000	8853.38	I. Munia Taluka Survey No. 22 (2500 acres) II. Hala Survey No. 46 (5000 acres) III. Saeedabad Survey No. 22 (2500 acres) Total (8853.38 acres)
5.	Jamshoro	10000	11500	I. Deh Sonwalhar Taluka Kotri (2500 acres) II. Deh Mahran Taluka Samwan (3000 acres) & Deh Radhak (1000 acres) III. Deh Dabhar Taluka Munghand (2500 acres) IV. Deh Kalo Khohar Taluka Thano Boha Khar (1500 acres) Total (11,500 acres)
6.	Tharparkar	10000	10000	I. Taluka Mirbi Deh Vaghyar 800 acres Deh Akherai 1000 acres Deh Musasar 675 acres Total 2475 acres II. Taluka Nagarparkar Deh Mau Khanor 500 acres Deh Veravathi Karan 750 acres Deh Mokarot Karan 375 acres Total 1625 acres III. Taluka Islamkot Deh Galla 400 acres

				Deh Manjhetli 250 acres Deh Morarano 750 acres Total 1400 acres
				IV. Taluka Diplo Deh Kounral 500 acres -do- Deh Talo 300 acres -do- Deh Dabra 300 acres -do- Deh Marad Lashari 200 acres -do- Deh Diplo 200 acres Total 1500 acres
				V. Taluka Chachro Deh Naupiro 380 acres -do- Deh Saranghia 594 acres -do- Deh Karnore 106 acres -do- Deh Adam Rind 75 acres -do- Deh Karoro 50 acres -do- Deh Karoro 50 acres -do- Deh Karoro 50 acres -do- Deh Chaper Din M. Shah 380 acres -do- Deh Mithrio 70 acres -do- Deh Mithrio kerie 26 acres Total 1500 acres
				VI. Taluka Dahli Deh Khensur 750 acres -do- Deh Dhakiyoon 45 acres -do- Deh Panat 50 acres -do- Deh Dahli 60 acres -do- Deh Dhakiyoon 595 acres Total 10000 acres.
7.	Thatta	10000	10000	Taluka Thatta Deh Kohistan 711 Tapo Jhampir Total 10000 acres

You are therefore requested to kindly forward the applications to this Department under the statement of conditions 2015 (Renewable Energy) for taking further necessary action.


SECTION OFFICER-VI
LAND UTILIZATION DEPARTMENT

A copy is forwarded to:-

1. PS to Member, Land Utilization Department, Government of Sindh, Karachi.
2. P.A to Additional Secretary Land Utilization Department Karachi.
3. Director (Wind) Energy Department Karachi.

GOVERNMENT OF SINDH
DIRECTORATE OF ALTERNATIVE ENERGY
ENERGY DEPARTMENT

MINUTES OF THE MEETING

Subject: Meeting of Committee of Expert Regarding Scrutiny/Examine/Survey the Requirement of Land for Wind/Solar Power Projects in Sindh

The meeting of the Committee of Expert (CoE) to examine the proposals for the requirement of land for the development of Wind/Solar Energy projects was held under the chairmanship of Director Alternative Energy, Energy Department on May 12, 2017 in the Committee Room of Energy Department, 3rd Floor, State Life Building No 3 and opposite CM house Karachi. The List of the participants is attached at Annexure-I.

2. AC Kotri and AC Manjhand did not attend the meeting due to census at Jamshoro District and Lal Shahbaz Qalandar's Urs duty at Sehwan. The Chair welcomed the participants and asked the Secretary of the Committee to place each of the Agenda Items one by one before the committee.

3. The detailed deliberations held on each of the agenda items are submitted as under:

AGENDA-I: 1. LEASE/ALLOTMENT OF 300 ACRES FOR THE DEVELOPMENT OF 1ST PHASES OF 50MW WIND PROJECT (OUT OF ALREADY ALLOTTED 2000 ACRES FOR 100MW WIND PROJECT AND SURRENDER 1700ACRES) BY M/S MASTER GREEN ENERGY LTD

2. ALLOTMENT OF 440ACRES OF LAND FOR THE DEVELOPMENT OF 50MW WIND PROJECT IN 2ND PHASES BY M/S MASTER GREEN ENERGY LTD

4. The Committee was informed that LOI for the development of 100MW wind power project was issued to M/s Master Green Energy Ltd. by Directorate of Alternative Energy, Energy Department Govt. of Sindh on October 1, 2015. The Land Utilization Department allotted 2000 acres of land at Son Walhar, Taluka Kotri, District Jamshoro.

5. The project sponsors conducted feasibility studies including, wind resources assessment, geotechnical, environmental, and grid interconnection study, etc.. The project sponsor also informed that NTDC/CPPA approved grid interconnection study for 50MW wind project only. Therefore M/s Master Green Energy Ltd requested for the development of project into two phases of 50MW each and also requested for allotment of land for each 50MW wind project.

7. The project company informed that they have installed a wind mast on the allotted land of 2000 acres block and based on the wind direction and speed they developed the strips of 300 acres for the development of 50MW Wind project (map enclosed). Accordingly out of 2000 acres they will retain 300 acres for the development of 50MW Wind project in phase-I and surrender the remaining 1700 acres of land. The project company also requested that in the south of existing land, 440 acres land in strips may be provided for the development of 50MW wind project in phase-II.

8. The availability of the proposed land is already received from the DC Office Jamshoro.

Recommendation:

9. The CoE recommended that

- i. the lease/allotment of 300 acres of land (with following coordinates) out of already allotted 2000 acres for the development of 50MW Wind project in phase-I may be recommended to Land Utilization Department. Furthermore,

- remaining 1700 acres of land will be reverted back to Government from the project company as per rules/policy.
- ii. 440 acres of land (with following coordinates) for the development of 50MW wind power in phase-II at Deh Son Walhaar, District Jamshoro may be recommended for allotment to M/s Master Green Energy Ltd.

Coordinates for 50MW Wind Power project in Phase-I

M/s Master Green Energy Ltd							
S.no	Details	Long	Lat	S.no	Details	Long	Lat
1	300 Acres	25° 23' 34.31"N	68° 7' 28.61"E	9	300 Acres	25° 23' 0.77"N	68° 8' 28.90"E
2		25° 22' 53.25"N	68° 8' 13.48"E	10		25° 23' 19.14"N	68° 8' 53.22"E
3		25° 22' 55.71"N	68° 8' 18.34"E	11		25° 22' 28.33"N	68° 9' 49.58"E
4		25° 23' 36.78"N	68° 7' 33.47"E	12		25° 22' 30.87"N	68° 9' 54.41"E
5		25° 22' 56.02"N	68° 8' 22.59"E	13		25° 23' 58.45"N	68° 8' 17.21"E
6		25° 22' 57.58"N	68° 8' 24.52"E	14		25° 23' 55.98"N	68° 8' 12.33"E
7		25° 22' 11.05"N	68° 9' 16.73"E	15		25° 23' 20.28"N	68° 8' 51.95"E
8		25° 22' 13.53"N	68° 9' 21.47"E	16		25° 22' 57.41"N	68° 8' 21.74"E

Coordinates for 50MW Wind Power project in Phase-II

M/s Master Green Energy Ltd							
S.no	Details	Long	Lat	S.no	Details	Long	Lat
1	440 Acres	25° 1' 47.78"N	68° 3' 15.08"E	23	440 Acres	25° 3' 22.56"N	68° 5' 22.10"E
2		25° 1' 18.95"N	68° 3' 47.14"E	24		25° 3' 32.75"N	68° 5' 11.06"E
3		25° 1' 23.48"N	68° 3' 52.26"E	25		25° 3' 28.01"N	68° 5' 5.03"E
4		25° 1' 46.90"N	68° 3' 26.19"E	26		25° 3' 24.73"N	68° 5' 9.67"E
5		25° 2' 2.53"N	68° 3' 43.14"E	27		25° 3' 9.11"N	68° 4' 52.75"E
6		25° 1' 38.77"N	68° 4' 9.58"E	28		25° 3' 15.80"N	68° 4' 45.26"E
7		25° 1' 43.28"N	68° 4' 14.70"E	29		25° 3' 11.20"N	68° 4' 40.25"E
8		25° 2' 7.17"N	68° 3' 48.16"E	30		25° 3' 4.46"N	68° 4' 47.72"E
9		25° 2' 22.80"N	68° 4' 5.08"E	31		25° 2' 48.85"N	68° 4' 30.30"E
10		25° 1' 58.52"N	68° 4' 32.11"E	32		25° 3' 1.60"N	68° 4' 16.57"E
11		25° 2' 2.96"N	68° 4' 37.23"E	33		25° 2' 56.94"N	68° 4' 11.52"E
12		25° 2' 27.42"N	68° 4' 10.10"E	34		25° 2' 44.14"N	68° 4' 25.69"E
13		25° 2' 43.00"N	68° 4' 26.98"E	35		25° 2' 28.57"N	68° 4' 8.64"E
14		25° 2' 25.97"N	68° 4' 45.86"E	36		25° 2' 48.01"N	68° 3' 47.15"E
15		25° 2' 33.59"N	68° 4' 47.79"E	37		25° 2' 43.40"N	68° 3' 42.12"E
16		25° 2' 47.70"N	68° 4' 32.07"E	38		25° 2' 23.93"N	68° 4' 3.80"E
17		25° 3' 3.29"N	68° 4' 48.99"E	39		25° 2' 8.30"N	68° 3' 46.59"E
18		25° 2' 52.47"N	68° 5' 1.03"E	40		25° 2' 33.56"N	68° 3' 18.76"E
19		25° 2' 58.12"N	68° 5' 4.95"E	41		25° 2' 28.97"N	68° 3' 13.71"E
20		25° 3' 7.93"N	68° 4' 54.02"E	42		25° 2' 3.68"N	68° 3' 41.86"E
21		25° 3' 23.55"N	68° 5' 10.95"E	43		25° 1' 48.04"N	68° 3' 24.91"E
22		25° 3' 16.96"N	68° 5' 18.18"E	44		25° 1' 57.34"N	68° 3' 14.56"E

AGENDA-II: ALLOTMENT OF LAND FOR ESTABLISHMENT OF 50 MW SOLAR POWER PROJECT BY M/S SINDH RENEWABLE ENERGY COMPANY (SREC)

10. The Committee was informed that M/s Sindh Renewable Energy Company (SREC) is incorporated under the companies ordinance 1904 by the then Sindh Board of Investment, Government of Sindh for the development of Renewable Energy Projects in public sector under the administrative control of Energy Department, Government of Sindh.

The Energy Department, Government of Sindh is establishing a 50MW solar power project with the financial support of World Bank through SREC. Concept Clearance Proposal of the project has been approved by the Competent Forum. SREC has requested for 250 acres of land at Manjhand District Jamshoro for the development of said 50MW solar power project.

11. The availability of the proposed land, which falls in Manjhand, District Jamshoro, has already been received from DC Office Jamshoro.

Recommendation:

12. The CoE recommended that the request of the sponsor for the allotment of 250 acres land (with following coordinates) may be considered for the development of 50MW solar power project as per Statement of Condition 2015, so that the project sponsors may conduct Feasibility Studies for the project development.

M/s Sindh Renewable Energy Company (50MW)			
S.No	Land Required	Latitude	Longitude
1	250 Acres	25.768176°N	68.264433°E
2		25.758516°N	68.264881°E
3		25.758580°N	68.273965°E
4		25.768007°N	68.274047°E

13. The meeting ended with a vote of thanks.

ANNEXURE B

PROJECT APPRAISAL DOCUMENT (PAD)

Document of
The World Bank
FOR OFFICIAL USE ONLY

Report No: PAD2623

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR 69.6 MILLION (US\$100 MILLION EQUIVALENT)

TO THE

ISLAMIC REPUBLIC OF PAKISTAN

FOR A

SINDH SOLAR ENERGY PROJECT

MAY 23, 2018

Energy & Extractives Global Practice

South Asia Region

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CURRENCY EQUIVALENTS
(Exchange Rate Effective Apr 30, 2018)

Currency Unit = Pakistan Rupees (PKR)

PKR115.77 = US\$1

US\$1.438 = SDR1

FISCAL YEAR
July 1 – June 30

ABBREVIATIONS AND ACRONYMS

AEDB	Alternative Energy Development Board
AG	Accountant General
AGP	Auditor General of Pakistan
CAPEX	Capital expenditure
CGA	Controller General of Account
CPPA	Central Power Purchase Agency
CO₂	Carbon dioxide
CPS	Country Partnership Strategy
DA	Designated account
DFI	Development finance institution
DISCO	Distribution company
EIRR	Economic internal rate of return
ENPV	Economic net present value
EPA	Energy purchase agreement
EPC	Engineering, procurement, and construction
ERR	Economic rate of return
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FABS	Financial Accounting and Budgeting System
FHH(s)	Female headed household(s)
FIRR	Financial internal rate of return
FM	Financial management
GCF	Green Climate Fund
GDP	Gross domestic product
GENCO	Generation company
GHG	Greenhouse gas
GoS	Government of Sindh
HFO	Heavy fuel oil

ICT	Information and communication technology
IDA	International Development Association
IFC	International Finance Cooperation
NDC	Nationally Determined Contribution
IPP	Independent power producer
IRR	Internal rate of return
IUFR	Interim Unaudited Financial Report
LNG	Liquefied natural gas
M&E	Monitoring and evaluation
MDB	Multilateral development bank
MTF	Multi-Tier Framework
NEPRA	National Electric Power Regulatory Authority
NPV	Net present value
NTDC	National Transmission and Despatch Company
O&M	Operation and maintenance
OPEX	Operating expense
PDO	Program Development Objectives
PMU	Project management unit
PPA	Power purchase agreement
PV	Photovoltaic
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SED	Sindh Energy Department
SHS	Solar home system
SPV	Special-purpose vehicle
SREC	Sindh Renewable Energy Company
SSEP	Sindh Solar Energy Project
SSP	Solar service provider
WAPDA	Water and Power Development Authority
WB(G)	World Bank (Group)
<i>All dollar amounts are U.S. dollars (US\$) unless otherwise indicated</i>	

Acting Regional Vice President: Ethel Sennhauser

Country Director: Patchamuthu Illangovan

Senior Global Practice Director: Riccardo Puliti

Practice Manager: Demetrios Papathanasiou

Task Team Leader(s): Oliver Knight, Anjum Ahmad



BASIC INFORMATION

Country(ies)	Project Name	
Pakistan	Sindh Solar Energy Project	
Project ID	Financing Instrument	Environmental Assessment Category
P159712	Investment Project Financing	B-Partial Assessment

Financing & Implementation Modalities

<input type="checkbox"/> Multiphase Programmatic Approach (MPA)	<input type="checkbox"/> Contingent Emergency Response Component (CERC)
<input type="checkbox"/> Series of Projects (SOP)	<input type="checkbox"/> Fragile State(s)
<input type="checkbox"/> Disbursement-linked Indicators (DLIs)	<input type="checkbox"/> Small State(s)
<input type="checkbox"/> Financial Intermediaries (FI)	<input type="checkbox"/> Fragile within a non-fragile Country
<input type="checkbox"/> Project-Based Guarantee	<input type="checkbox"/> Conflict
<input type="checkbox"/> Deferred Drawdown	<input type="checkbox"/> Responding to Natural or Man-made Disaster
<input type="checkbox"/> Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
14-Jun-2018	29-Sep-2023
Bank/IFC Collaboration	Joint Level
Yes	Complementary or Interdependent project requiring active coordination

Proposed Development Objective(s)

The Development Objective is to increase solar power generation and access to electricity in Sindh Province.

Components



Component Name	Cost (US\$, millions)
Component 1: Utility-Scale Solar	40.00
Component 2: Distributed Solar	25.00
Component 3: Solar Home Systems	30.00
Component 4: Capacity Building and Technical Assistance	5.00
PMU Costs	5.00

Organizations

Borrower: Islamic Republic of Pakistan
Implementing Agency: Energy Department - Government of Sindh

PROJECT FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	105.00
Total Financing	105.00
of which IBRD/IDA	100.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	100.00
IDA Credit	100.00

Non-World Bank Group Financing

Counterpart Funding	5.00
Borrowing Agency	5.00

**IDA Resources (in US\$, Millions)**

	Credit Amount	Grant Amount	Total Amount
National PBA	100.00	0.00	100.00
Total	100.00	0.00	100.00

Expected Disbursements (in US\$, Millions)

WB Fiscal Year	2018	2019	2020	2021	2022	2023	2024
Annual	0.00	3.80	15.00	28.64	35.25	17.00	0.31
Cumulative	0.00	3.80	18.80	47.44	82.69	99.69	100.00

INSTITUTIONAL DATA**Practice Area (Lead)**

Energy & Extractives

Contributing Practice Areas

Climate Change

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag**Does the project plan to undertake any of the following?**

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF	Yes
b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment	Yes
c. Include Indicators in results framework to monitor outcomes from actions identified in (b)	Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)



Risk Category	Rating
1. Political and Governance	● Moderate
2. Macroeconomic	● Moderate
3. Sector Strategies and Policies	● Moderate
4. Technical Design of Project or Program	● Moderate
5. Institutional Capacity for Implementation and Sustainability	● Moderate
6. Fiduciary	● Substantial
7. Environment and Social	● Moderate
8. Stakeholders	● Moderate
9. Other	
10. Overall	● Moderate

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

☐ Yes ☒ No

Does the project require any waivers of Bank policies?

☐ Yes ☒ No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04		✓
Forests OP/BP 4.36		✓
Pest Management OP 4.09		✓
Physical Cultural Resources OP/BP 4.11	✓	



Indigenous Peoples OP/BP 4.10	✓
Involuntary Resettlement OP/BP 4.12	✓
Safety of Dams OP/BP 4.37	✓
Projects on International Waterways OP/BP 7.50	✓
Projects in Disputed Areas OP/BP 7.60	✓

Legal Covenants

Sections and Description

Provision of a minimum of US\$5,000,000 equivalent as counterpart funds [Project Agreement, Schedule, Section I.D.].

Sections and Description

No later than one (1) month after Effectiveness, establishment of the Project Steering Committee [Project Agreement, Section I.A.1].

Sections and Description

No later than forty-five days (45) days after Effectiveness, establishment of the PMU and recruitment or nomination of the Project Director [Project Agreement, Section I.A.2].

Sections and Description

No later than three (3) months after the Effectiveness, adoption of the Project Implementation Manual [PA, Section I.B] and recruitment of one procurement manager, one accounting officer in charge of financial management, and one environmental and social development officer [Project Agreement, Section I.A.2].

Sections and Description

No later than six (6) months after the Effectiveness, recruitment of one Project monitoring and evaluation specialist [Project Agreement, Section I.A.2].

Sections and Description

Strengthening of Sindh Energy Department [Project Agreement, Schedule, Section I.A.3]:

i) No later than one (1) month after Effectiveness, preparation of an annual internal audit plan for the Project and

quarterly audits thereafter;

ii) No later than two (2) months after Effectiveness, one superintendent vacancy filled.

Sections and Description

Compliance with requirements on Safeguards (including quarterly reporting), Annual Work Plans, Budgets, and Mid-Term Review [Project Agreement, Schedule, Section I].

Conditions

Type	Description
Disbursement	Condition of disbursement of the funds allocated to Category 2 (grants under Component 3 of the Project): adoption of the Project Operations Manual in form and substance satisfactory to the Association [Financing Agreement, Schedule 2, Section III. B. 2].



PAKISTAN
SINDH SOLAR ENERGY PROJECT
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I. STRATEGIC CONTEXT

A. Country Context

1. **Pakistan, with an estimated population of over 207 million people, is the world's sixth most populous country.** In recent years, it has achieved continued Gross Domestic Product (GDP) growth and substantially reduced poverty. Provisional official estimates suggest that the GDP grew by 5.8 percent for Fiscal Year (FY) 17/18 up from 5.4 percent in FY16/17, and the government's growth target for FY19 is 6.2 percent. Fiscal and external imbalances if not addressed may however erode these gains in the future. The national poverty headcount declined from 64.3 percent in FY02 to 29.5 percent in FY14. Nevertheless, inequality persists and the country continues to rank low on the human development index at 147th out of 188 countries.

2. **Sindh, with an estimated 47 million people,¹ has a large economy centered on Karachi, is in a key geographic situation, and has abundant natural resources.** However, recent growth and social development trends indicate that the province is not realizing its full potential because of underlying structural challenges.

B. Sectoral and Institutional Context

3. **Pakistan was one of the first countries to reform its power sector, in the early 1990s.** The first stages of reform were aimed at attracting private investment into the generation segment and were initially highly successful. The Government also unbundled the Power Wing of the Water and Power Development Authority (WAPDA), which had been a publicly owned, vertically integrated monopoly with responsibility for generation, transmission, and distribution: four thermal generation companies (GENCOs) and eight distribution companies (DISCOs) were formed, and the large hydropower assets remained with WAPDA. The National Transmission and Despatch Company (NTDC) was also established as the single buyer of electricity and to be the transmission network owner and system operator. The National Electric Power Regulatory Authority (NEPRA), was also set up and is responsible for licensing, determining tariffs, creating standards, and monitoring sector performance. Under the 18th Amendment to the Constitution, the provinces may generate, transmit, and distribute power within their territorial jurisdiction, although the provinces' use of these powers has so far been limited.

4. **Despite the promising start, improvements in power sector performance remain elusive.** In the past two decades there have been a few further reforms, including the privatization of some generation assets and the Karachi Electricity Supply Company (K-Electric), an integrated power utility serving Karachi,

¹ Pakistan Bureau of Statistics. 2018. "Provisional Summary Results of 6th Population & Housing Census-2017." <http://www.pbscensus.gov.pk/>



its suburbs, and parts of Balochistan Province. More recently, the single buyer function has been separated from NTDC and is now the responsibility of the Central Power Purchasing Agency (CPPA). The plans to privatize GENCOs and DISCOs have not yet been followed through. In addition, the competitive market for generation, originally planned to start by 2012, has not yet been put in place.

5. **The sector lacks commercial discipline and operational effectiveness.** Although performance across the DISCOs varies, in aggregate, technical and nontechnical losses remain relatively high at around 18 percent,² while collections are relatively low at around 94 percent. These factors have contributed to a chronic liquidity crisis. In December 2016 the accumulated arrears of payments from DISCOs to their suppliers, commonly called the circular debt, reached an estimated PKR374 billion (US\$3.4 billion),³ or around 1.2 percent of GDP. Furthermore, because of the weak institutional setting, company accountabilities are not fully enforced or recognized, and companies continue to operate under centralized control. Inadequate power supply and poor-quality electricity service have reduced GDP growth by an estimated two percentage points annually for the past several years.

6. **Power shortages have resulted from inadequate power system investment.** From the mid-1990s to FY09/10, investment in power infrastructure declined from 26 percent of total investment and 51 percent of public investment to four percent and 26 percent, respectively. New private sector investment essentially came to a halt. The decline in investment was due to water use concerns, which constrained hydropower development, and a power surplus that emerged in 2002 because independent power producers (IPPs) installed too much capacity.

7. **Generation capacity shortages persist because of the limited availability of capacity and continued financial liquidity constraints.** Increases in electricity coverage and the normal increases in demand over time, have resulted in a growth in peak demand of an estimated eight percent a year to around 29,000 MW in June 2017. While the total installed capacity was around 31,000 MW, the actual shortfall remains stubbornly high at an estimated 5,000–7,000 MW. In addition, the shortage of financial liquidity to cover fuel payments obliges the Government to limit generation to typically around 100 terawatt hours (TWh) per year (excluding K-Electric). This results in load shedding of about 6-8 hours a day for households and 1-2 hours for industrial consumers during periods of peak demand. To address the gap between the demand for and supply of electricity, the Government plans to increase generation capacity by 30,000 MW by 2022,⁴ and this plan is beginning to bear fruit.

² NEPRA. 2016. "Performance Evaluation of DISCOs & K-Electric 2015-16." <http://www.nepra.org.pk/Standards/2017/PER%202015-16.pdf>.

³ International Monetary Fund. 2017. Country Report No. 17/212. <https://www.imf.org/~media/Files/Publications/CR/2017/cr17212.ashx>.

⁴ Prime Minister's Office. 2016. Press Release (2016, December 19): "Our power generation plans go beyond ending load shedding by 2018." http://www.pmo.gov.pk/press_release_details.php?pr_id=1624.



8. **Despite huge hydropower and renewable energy potential, Pakistan's electricity mix is becoming more reliant on imported fossil fuels, and thus more vulnerable to price volatility.** The energy sector is the largest contributor to Pakistan's greenhouse gas (GHG) emissions at 46 percent of total emissions,⁵ and will grow with the planned increase in coal-fired generation capacity. In its Nationally Determined Contribution (NDC),⁶ Pakistan committed to reduce up to 20 percent of its projected GHG emissions, subject to the availability of international grants to meet the US\$40 billion estimated abatement cost. The main mitigation options presented in its NDC are (a) increased grid efficiency; (b) improved coal efficiency; and (c) large-scale and distributed grid-connected solar, wind, and hydroelectricity. For solar and wind, the resource potential is very significant, especially in the south and west of the country. Estimated solar photovoltaic (PV) output ranges from 1400-2000 kWh per kW peak (KWp) per year outside the mountainous northern provinces,⁷ and there is an average wind speed of 7.82 meters per second in the country's 10 windiest areas.⁸

9. **Even with a policy regime that is conducive for renewable energy, installed solar and wind power capacity remain relatively low at 430 MW and 940 MW, respectively.**⁹ In 2006 the Government published its renewable energy policy document covering small hydropower (<50 MW), solar, and wind, and setting out an initial plan for developing renewable energy in the country.¹⁰ The Alternative Energy Development Board (AEDB) was established as an autonomous body that would promote and facilitate the exploitation of renewable energy projects in Pakistan. As the first step in developing a renewable energy project, the provincial Energy Departments and AEDB issue a Letter of Intent to project sponsors. Under the renewable energy policy, once the developer has secured all requisite approvals in the development process and has signed an Energy Purchase Agreement (EPA) with CPPA, K-Electric, or another DISCO, it is mandatory for the distribution utility to purchase all of the electricity offered to them by the project. However, progress has been slow, with wind development primarily in Sindh Province and solar PV development primarily in Punjab. Until 2016 NEPRA provided an "up-front tariff" for solar and wind power, equivalent to a "feed-in tariff," but in 2017 NEPRA announced that future solar and wind

⁵ UNFCCC. 2015. Pakistan's Intended Nationally Determined Contribution (PAK-INDC). <http://www4.unfccc.int/ndcregistry/PublishedDocuments/Pakistan%20First/Pak-INDC.pdf>

⁶ By decision 1/CP.21, paragraph 22, the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) invited Parties to communicate their first NDC no later than when the Party submits its respective instrument of ratification, acceptance, approval or accession. If a Party has communicated an intended nationally determined contribution (INDC) prior to joining the Agreement, that Party shall be considered to have satisfied this provision unless that Party decides otherwise. <https://unfccc.int/process/the-paris-agreement/status-of-ratification>

⁷ World Bank. 2017. "Global Solar Atlas." <http://globalsolaratlas.info>.

⁸ World Bank. 2017. "Global Wind Atlas." <https://globalwindatlas.info>.

⁹ AEDB. 2018. "Alternative & Renewable Energy Sector of Pakistan." Presentation at workshop in Islamabad on April 11, 2018.

¹⁰ AEDB. 2006. "Policy for Development of Renewable Energy for Power Generation". <http://aedb.org/Documents/Policy/REpolicy.pdf>



projects would be awarded tariffs through competitive bidding.¹¹ So far, no solar or wind capacity auction has been launched.

10. **The electricity access rate in Pakistan is highly uncertain, but there are likely to be significant access gaps in rural areas.** The most recent census, in 2017, indicates that there are over 32 million households in the country, and NEPRA reports just under 23 million household connections,¹² which means an electricity access rate of just over 70 percent. In Sindh Province, however, the rate is much lower, at 37 percent. The International Finance Corporation (IFC) estimates that around 24 million households are currently either without a grid connection or are suffering from severe under-electrification (those with working grid connections but without adequate supply).¹³ Previous efforts to bridge the gap in electricity access have been conducted primarily through grid extension, which is uneconomic in some rural areas because of low population density and high dispersion among rural settlements. Provision of off-grid solutions have relied on small hydropower in the northern provinces, and there have been limited attempts to provide solar home systems (SHSs) in the southern provinces. However, government-provided SHSs often suffer from high rates of system failure and abandonment, especially when no long-term operation and maintenance (O&M) support is in place. In the absence of a decent electricity service, Pakistani households spend an estimated US\$2.3 billion annually on alternative lighting products/services such as kerosene, gas lights, and battery-powered torches.

C. Rationale for the Project

11. **As a result of sustained equipment and construction cost reductions internationally, and the experience gained from several early projects, solar PV is now a low-cost option for additional power capacity.** Transitioning to renewable energy offers Pakistan the potential to reduce its average cost of generation, diversify away from imported fossil fuels, and realize climate change, air pollution, and water conservation benefits. However, to continue to drive down the cost of solar power Pakistan needs to fully implement competitive bidding through a stable, transparent, and predictable series of solar auctions, leveraging successful international experience. There is also a need for future solar and wind projects to be developed more strategically than in the past, taking account of land availability, grid capacity, and grid integration issues—a fact that argues in favor of a stronger government role in identifying and

¹¹ NEPRA. 2017. "Decision of Authority in the Matter of Solar PV Power Generation Tariff." March 3, 2017. See also NEPRA. 2017. "Determination of New Tariff for Wind Power Generation Projects." January 27, 2017.

¹² NEPRA. 2016. "State of Industry Report 2016." <http://www.nepra.org.pk/Publications/State%20of%20Industry%20Reports/NEPRA%20State%20of%20Industry%20Report%202016.pdf>.

¹³ IFC. 2015. "Pakistan Off-Grid Lighting Consumer Perceptions: Study Overview." <http://lightingasia.org/Pakistan/market-intelligence/>



predeveloping sites for the private sector development of solar power plants.

12. **With a likely access deficit in both the availability and quality of electricity supply, Pakistan has the potential to be a large market for SHSs¹⁴ at a time when commercial provisioning of such systems is starting to take off.** However, Pakistan's SHS market is characterized as early-stage, with only limited adoption of pay-as-you-go technology, despite a potential market size of 22 million households.¹³

13. **Sindh Province is key to increasing the share of renewable energy generation in Pakistan and to developing new ways of providing electricity access.** With excellent solar resources, ample non-arable land, private and public sector electric utilities, and the only provincial transmission company in the country, Sindh has the potential for installing gigawatts of least-cost solar and wind power over the next decade. Working in partnership with the Federal Government, national agencies, DISCOs, and IPPs, Sindh has the mandate under the 18th Constitutional Amendment to plan and deliver strategic public investments by predeveloping solar parks through land preparation, power evacuation, grid strengthening, and potentially storage provision to ensure the lowest prices to consumers by de-risking project development. There is opportunity for utilizing the free space on and around public buildings to generate solar power in major urban areas, helping to meet the increasing daytime load from air conditioning and reducing the electricity bills of public sector consumers. On electricity access, the remoteness of off-grid villages, the inability of many consumers to afford grid connections, and the erratic provision of power argues in favor of expanding the SHS market, with technically and commercially sustainable product solutions.

14. **Sindh requires a strong Energy Department to plan and deliver strategic public investments, build markets for provision of solar power and SHS, and attract commercial financing.** Sindh Energy Department (SED) has been instrumental in attracting private sector investors to the Gharo and Jhimpir wind corridors in Sindh, where there is now around 800 MW of commissioned generation. Additionally, SED is promoting biomass and hydropower generation through small pilot projects of 5-10 MW, and for many years it has provided SHS to rural communities on a relatively small scale. SED is also keen to adopt a private sector approach for facilitating increased electricity access, supported by public funding where affordability gaps remain. Delivering against these objectives will require enhanced capacity within SED to design and deliver large, complex interventions, engage with key stakeholders, and develop robust procedures for the handling of fiduciary, procurement, and safeguards issues.

D. Higher-Level Objectives to which the Project Contributes

15. The proposed Sindh Solar Energy Project (SSEP, or the Project) is aligned with the World Bank Group's Country Partnership Strategy (CPS) FY15-19, discussed by the Board on May 1, 2014 (Report no. 84645), which was extended to FY20 in the Performance and Learning Review, discussed by the Board on June 15, 2017 (Report No. 113574). It is also aligned with the twin goals of ending extreme poverty and

¹⁴ WBG. 2018. "Global Off-Grid Market Trends Report: 2018." Washington, DC. <https://www.lightingglobal.org/2018-global-off-grid-solar-market-trends-report/>.



promoting shared prosperity. It supports Results Area 1 (Energy) by increasing generation of renewable energy and access to electricity. The Project specifically supports CPS Outcomes 1.1 (reduced load shedding) and 1.2 (reduced cost of production of electricity) through investment in new solar power capacity, now a highly competitive option for new-build electricity generation in Pakistan, and by increasing access to electricity. The operation is also aligned with the Government's 2025 Vision, and its 2006 Policy for Development of Renewable Energy for Power Generation. The operation also incorporates specific measures on gender, 100 percent climate co-benefits as a result of the focus on renewable energy, and by Maximizing Finance for Development through private sector delivery and by leveraging commercial finance.

16. There is a strong development rationale for the public-sector support for the Project. The World Bank (WB) has experience supporting the design and implementation of similar programs, such as in Argentina, Armenia, India and Zambia when it comes to utility-scale and distributed solar power development, and in Bangladesh and Kenya on increasing electricity access through support for privately-provided SHSs.

II. PROGRAM DEVELOPMENT OBJECTIVES

A. Project Development Objective

17. **The Development Objective is to increase solar power generation and access to electricity in Sindh Province.**

B. Project Beneficiaries

18. **The final project beneficiaries are Pakistani consumers and households, who will gain from low-cost, secure, and clean electricity.** The direct project beneficiaries include the following:

- (a) SED, which will (i) meet its objectives of attracting private sector investment in solar power; (ii) gain knowledge and experience in setting up a world-class competitive bidding regime and developing solar parks, leading to a healthy return on investment; (iii) gain knowledge and experience in developing a distributed solar PV scheme on/around public buildings; (iv) achieve much greater efficiencies in the use of public funding to increase electricity access by leveraging private sector provision of SHSs; and (v) improve its capacity to carry out monitoring and evaluation (M&E), including product quality assurance;
- (b) Private sector IPPs, which will gain opportunities for investment in de-risked solar power projects;
- (c) Public sector agencies and DISCOs in Sindh, which will benefit from reduced public sector electricity bills through the installation of distributed solar PV, thereby helping to reduce the circular debt; and
- (d) Households with no or a low level of electricity access in Sindh, who will benefit from provision of SHSs.



C. PDO-Level Results Indicators

19. **Achievement of the PDO will be measured using the following two indicators:**¹⁵

- (a) Renewable energy generation capacity constructed under the project (MW); and
- (b) People provided with access to electricity under the project by household connections (off-grid).

III. PROJECT DESCRIPTION

A. Project Components

20. **The Project aims to support the deployment of solar power in Sindh Province through development of utility-scale solar power at highly competitive prices within strategically identified solar parks, installation of distributed solar power systems on and around public buildings, and provision of solar home systems for households with no or low access to electricity.** The Project includes four components, described below, and is further described in the results chain provided in Figure 1.

Component 1: Utility-Scale Solar (US\$40 million)

- (a) Identification and development of a series of publicly owned solar parks, including site identification; feasibility and environmental studies; land acquisition and resettlement; obtaining of permits; and up-front development of shared infrastructure such as grid connection and reinforcement, road access, security arrangements, and water supply; and
- (b) Provision of support for the competitive selection of private sector developers through solar auction for the construction of solar power plants in the solar parks developed under (a), including transaction advisory services, arrangements for off-taking of power, and financial support through equity or otherwise, as needed.

Component 2: Distributed Solar (US\$25 million)

Procurement and installation of solar PV systems and associated energy management systems on rooftops and other available space on and around public sector buildings, including building identification; feasibility and other related studies; arranging for interagency agreements and leasing arrangements; transaction advisory services and contracting arrangements for construction and O&M; and obtaining of permits and arranging for off-taking of power.

¹⁵ These are the two Corporate Results Indicators. The full set of PDO indicators and intermediary results indicators is provided in the Results Framework. The cumulative intermediate targets for each indicator start in December 2019 onwards, assuming that the first year will be focused on preparatory work and procurement.



Component 3: Solar Home Systems (US\$30 million)

- (a) Deployment of affordable SHSs in prioritized areas with low or no access to electricity; and
- (b) Analysis and identification of priority areas; activities to enhance consumer awareness and financial literacy; product certification and quality control; and M&E activities.

Component 4: Capacity Building and Technical Assistance (US\$5 million)

Implementation of a program of capacity-building and technical assistance activities to support the design and implementation of the Project and compliance with fiduciary, gender, M&E, procurement, and safeguards requirements. The component will include training for SED staff, Project stakeholders, and women; planning and synchronization of activities of the relevant experts; consultation and coordination with key stakeholders and community groups; and data collection, including household energy surveys.

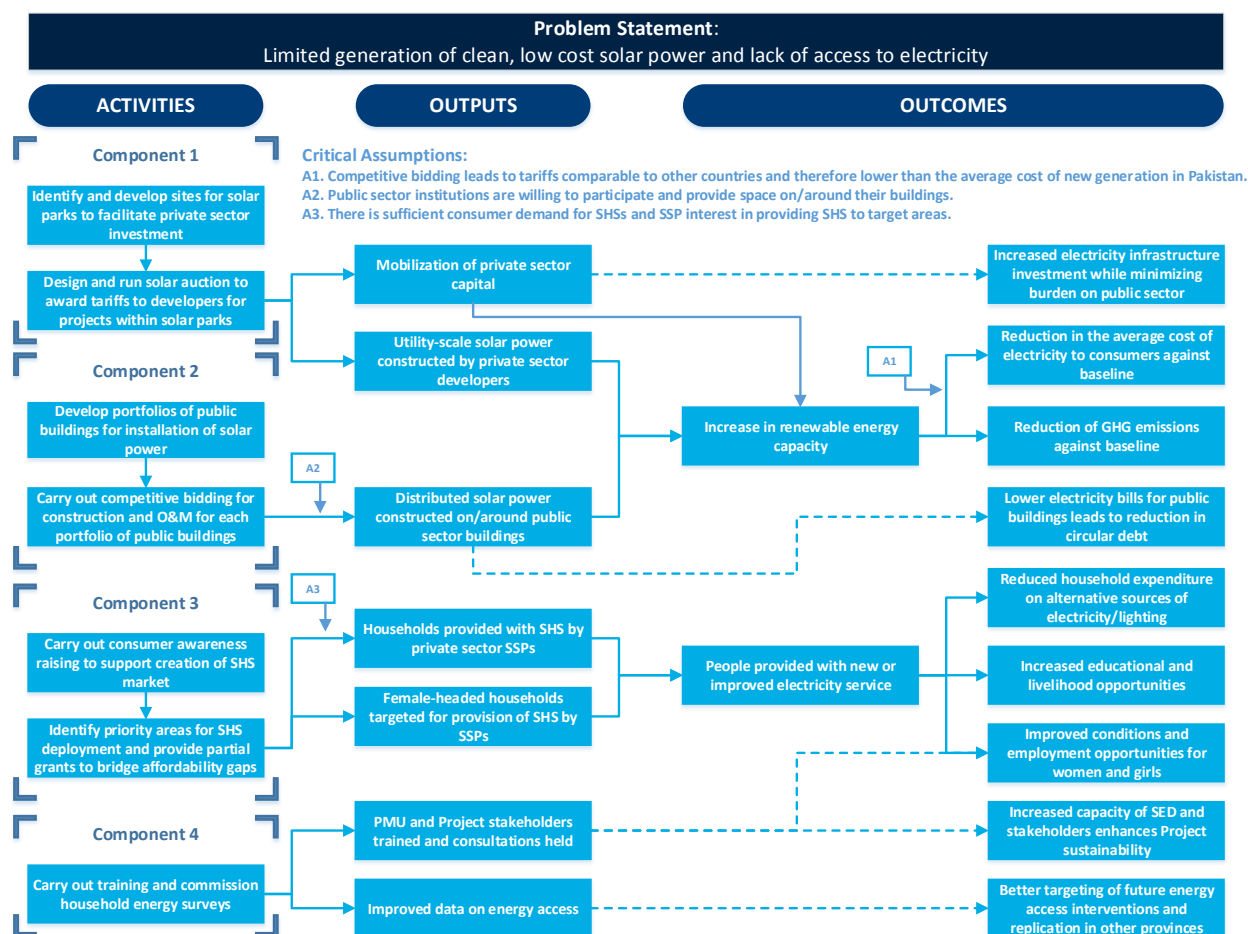
21. **Public funding will be used to leverage private sector investment and expertise.** Under Component 1, the Project will provide shared infrastructure and a competitive bidding regime to select independent power producers for development of 400 MW of new solar power capacity (starting with an initial 50 MW pilot project), leading to the mobilization of an estimated \$273,500,000 of private sector capital. Component 2 will award contracts to private sector developers for the construction and long-term O&M of 20 MW of distributed solar power on and around public buildings in Karachi and Hyderabad, helping to reduce public sector electricity bills. Component 3 will support the commercial provision of SHS to 200,000 households by private sector solar solution providers (SSPs) by providing partial grants, a public awareness-raising campaign, and extensive monitoring and evaluation (M&E) to ensure adherence to high quality standards. In doing so, Component 3 will help expand SHS provision by encouraging additional SSPs to enter the Pakistan market. Component 4 supports implementation of the Project by investing in capacity building and technical assistance for SED and key Project stakeholders, including commissioning of household energy surveys at the start and end of the Project to inform delivery of Component 3. Although focused on Sindh Province, the Project is explicitly designed to provide national benefits by demonstrating new approaches that can be replicated in other provinces. In the context of potential new investment in fossil-fuel-fired generation capacity, and remaining gaps in the availability and quality of electricity supply, the Project is designed to help steer Pakistan toward a lower-carbon development pathway and support new approaches for provision of electricity access.

22. **Investment Project Financing (IPF) in the form of an IDA credit for SDR69,600,000 (equivalent to US\$100 million) is proposed for the Project, alongside US\$5 million of counterpart funding provided in local currency (PKR).** The counterpart funding will come from central GoS funds, and will cover the staff and set-up costs related to the project management unit (PMU). Retroactive financing will be available under the Project for an aggregate amount up to SDR 13,920,000 of the IDA credit for payments made for eligible expenditures on or after December 18, 2017. It is expected that any retroactive financing would be applied to project preparation activities such as feasibility and environmental studies related to Component 1. All expenditures for which retroactive financing is sought will be submitted by SED to the WB to verify their eligibility according to the project description and disbursement table, safeguards policies, and procurement requirements.

23. **The Project is designed to facilitate future expansion in both reach and scope through additional**

financing and/or parallel financing by other donors. In each of the investment components there is substantial opportunity for expansion if early results are obtained. For Component 1, additional, larger, or more complex solar parks could be added if there is a need for additional solar capacity in Sindh. For Component 2, the total space available on and around public buildings is known to be many orders of magnitude higher than the 20 MW target being proposed, and there may be significant opportunities to increase the scale and speed of deployment. For Component 3, opportunities for expansion include a substantial scale-up in the grant funding available to accelerate market development, for example by increasing the targeted number of households/people or expanding to more remote areas.

Figure 1: Results Chain¹⁶



¹⁶ A high-resolution version of the Results Chain is available as part of the project documents.



B. Lessons Learned and Reflected in the Project Design

24. **The Project builds on an increasing body of evidence on how best to facilitate private sector investment and ensure sustainability, drawing on lessons learned in Pakistan and internationally.**

- **Facilitating private sector involvement.** Consistent with the Maximizing Financing for Development approach of the World Bank Group (WBG), strategically using public funding to leverage private sector investment and expertise is central to this Project. This approach lies at the heart of Component 1: a relatively small amount of public investment in solar parks can help to de-risk project development, resulting in low tariffs under solar power auctions. This has already been demonstrated in WBG-financed projects in Argentina, India, and Zambia.¹⁷ For off-grid electricity access, private sector involvement helps minimize up-front public financing requirements, helps ensure that households get the services they desire, and leads to better long-term outcomes.
- **Sustainability of O&M.** Policymakers in Pakistan are concerned to ensure that interventions are commercially and technically sustainable over the long term. Pakistan's experience with distributed and off-grid solar generation so far has been poor: public sector installations often have had no O&M plan in place, leading to rapid deterioration of performance and eventually failure. Ensuring long-term O&M is central to this Project and is reflected in each of the components: in Component 1 through an annual fee paid to SED for developing and maintaining the solar park assets, and through private sector ownership of the solar power plants; in Component 2 by putting in place a performance-based O&M contract and establishing a revenue-generating model to cover long-term O&M; and in Component 3 through private sector delivery and the alignment of incentive structures to ensure a long-term presence in target communities.
- **Importance of having good data.** Experience from similar projects shows that using high-quality data can substantially improve design and implementation. In Zambia, as part of the Scaling Solar program, the Government carried out a comprehensive site identification process, involving assessment of daily load profiles in selected cities for suitability of solar PV supply, potential yield of a solar PV plant near selected cities, proximity to evacuation infrastructure, and assessment of the impact of solar PV plants on the transmission system. In India, the IFC-supported project on rooftop solar in Gujarat found that detailed technical surveys and data collection to identify buildings suitable for solar installations, which could be packaged into a bidding document, are the most important first step. Hundreds of surveys were conducted, leading to about 312 installations. And in Kenya, the WB's off-grid solar project has identified data gaps as one of the main challenges to be addressed to understand and expand the off-grid market.¹⁸ The Project includes substantial investment in data collection and integration across all four components.

¹⁷ Projects P159901, P154283, and IFC37811/P157943.

¹⁸ World Bank. 2017. "Kenya: Off-grid Solar Access Project for Underserved Counties." <http://projects.worldbank.org/P160009>.



IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

25. **The Project will be implemented by the Province of Sindh, as the Project Implementing Entity, through SED. A PMU will be created within SED that will be responsible for project implementation and supervision.** The PMU will have appropriate experts, will be headed by a full-time Project Director at the level of a senior government officer, and will consist of a small team of staff, budgeted for and funded by GoS. More specialist requirements, such as for transaction advisors to manage the solar auctions under Component 1, or for the M&E campaign under Component 3, will be supported by consultants as required, funded from the IDA credit under each component. The PMU's scope of work will include (a) design and implementation of the Project activities; (b) data collection and monitoring; (c) procurement-related activities; (d) preparation of an annual work plan for all Project activities and of annual financial reports; and (e) supervision and reporting on implementation of Environmental and Social Management Plans (ESMPs) and Resettlement Action Plans (RAPs) as required. A Project Steering Committee, chaired by the Secretary of SED, will be established to provide high-level oversight and guidance to the PMU on Project design and implementation issues. SED has already created the Sindh Renewable Energy Company (SREC) to be the holding company responsible for all publicly owned assets under Components 1 and 2, following a well-established model that led to the creation of the Sindh Transmission & Dispatch Company in 2015.

B. Results Monitoring and Evaluation

26. **M&E staff/consultants will support the PMU in any aspects related to the monitoring and evaluation of the Project.** They will be responsible for: (a) monitoring physical progress; (b) carrying out M&E of delivered outcomes; (c) reviewing and supervising the environmental and social issues identified and any mitigation measures; and (d) providing guidance to the PMU in early identification and resolution of any issues identified. Their scope of work will include: (a) establishing Management Information Systems, a Geographic Information System, and ICT-based monitoring and verification systems for all project components and activities; (b) monitoring the implementation and physical progress of any civil works, including environmental and social safeguards; (c) collecting and analyzing data on project impacts, including data on direct and indirect stakeholders under the Project; and (d) identifying and assessing problems during implementation and developing potential solutions.

27. **A household energy survey will be commissioned under Component 4 to provide baseline values for M&E, as well as to fill information gaps on the market size for SHS in Pakistan.** The survey will be carried out at the start and end of the Project, and will conform to the Multi-Tier Framework (MTF) approach for assessing access to electricity,¹⁹ including gender disaggregation. Throughout Project

¹⁹ The Multi-Tier Framework for Energy Access is a global standard for assessing and reporting energy access. See World Bank. 2015. "Beyond Connections: Energy Access Redefined." <https://openknowledge.worldbank.org/handle/10986/24368>.



preparation and implementation, robust stakeholder and citizen engagement mechanisms will be designed and implemented where needed.

C. Sustainability

28. **GoS is committed to scaling up solar power in Sindh Province, building on their success with wind power.** An official request for this Project was received from Economic Affairs Division (EAD) on behalf of GoS in March 2017, and since then the Project has been extensively discussed with GoS and federal government stakeholders. The Project is designed to build capacity within SED to scale up solar power within Sindh Province, and the fact that solar power is increasingly a least-cost form of electricity generation and provider of electricity access helps ensure long-term sustainability within each Component. There is also a strong emphasis on ensuring the commercial and technical sustainability of solar power plants and SHSs supported under the Project through the involvement of the private sector in Components 1 and 3, and incorporation of long-term O&M under Component 2.

D. Role of Partners

29. **The Project has attracted strong interest from other development partners and donors, including for possible co-financing during implementation.** Korea's Economic Development Cooperation Fund (EDCF) has expressed interest in possible co-financing, and it has been agreed to explore this further once the Project generates initial results. There is also the possibility of seeking funding from the Green Climate Fund (GCF) or other sources of climate finance, to scale up one or more of the Components or to respond to financing or affordability constraints that may be identified during implementation.

30. **In addition, the WB has secured grant funding for Bank-executed technical assistance to support Project implementation and national efforts to scale up renewable energy.** The Korean Green Growth Trust Fund (KGGTF) has committed grant funding for technical assistance and knowledge exchange activities, including prefeasibility work, study tours, and upstream analysis. Additionally, KGGTF provides a platform for SED and other stakeholders to collaborate with relevant Korean institutions and companies. The Energy Sector Management Assistance Program (ESMAP) has committed grant funding from its Lighting Global window for technical assistance and dissemination activities. Other sources of grant funding may also be explored.

31. **The Project also has linkages to ongoing or planned initiatives on renewable energy by other development partners, where close coordination will be required.** Kreditanstalt für Wiederaufbau (KfW) is actively exploring support to off-grid solar providers and microfinance institutions, and is closely aligned with the IFC Lighting Pakistan program, which aims to reach 1.5 million households by 2020, and therefore with the objectives of Component 3. IFC Advisory has an active program of support in Pakistan covering all three investment components, and is in close contact with SED and the WB team. The IFC and WB are exploring the possibility of grant-funded IFC technical assistance to support Component 1 in particular. United States Agency for International Development (USAID) is launching a new, multiyear Pakistan energy program at the national level, and will be carrying out a range of work that seeks to improve the deployment of renewable energy, contributing most directly to Component 1. The WB is in regular contact



with USAID and other development partners working in the energy sector through regular donor coordination meetings.

V. KEY RISKS

32. **The overall risk associated with the Project is assessed as Moderate.** The various risks related to the Project were assessed and are summarized in the Project data sheet. Three of the key risks, their assessment, and proposed mitigation measures are described below.

33. **Political and governance.** National elections scheduled for mid-2018, as well as state and local elections, may alter the authorizing environment for the Project or create delays. However, the strong commitment to and ownership of the Project that GoS has demonstrated is likely to ensure continuity on the GoS side. At a technical level, concerns over a projected supply surplus, the technical and commercial challenges of integrating variable renewable energy sources into the grid, and the potential for future cost reductions are creating new uncertainties. To help mitigate these risks, the WB is providing technical assistance to AEDB, CPPA, NTDC, and the Planning Commission to review the planning strategy for the electricity sector and provide recommendations on the scope for renewable energy capacity additions, taking account of commercial and technical constraints. Continued reductions in the cost of solar technologies will provide a strong incentive to reconsider prior assumptions. As a result, the political and governance risk is rated as Moderate.

34. **Institutional capacity for implementation and sustainability.** SED has no prior experience of implementing multilateral development bank (MDB) projects, and the Project relies on SED's rapidly building up its capacity and putting in place a highly functioning PMU. The risk to Project implementation and sustainability is mitigated by the dedicated budget that SED is seeking for PMU establishment and operation, and by the funds available under Component 4 for capacity building and technical assistance. The WB team will also provide substantial implementation support (see Annex 1), including through grant-funded technical assistance in parallel to the Project. The results indicators are graduated to acknowledge the need for and progress on preparatory activities. In addition, sustainability considerations have been integrated into the design of each component to ensure long-term O&M, and a return on investment for GoS in relation to Components 1 and 2. The risk for institutional capacity is therefore rated as Moderate.

35. **Procurement and financial management.** The WB carried out a procurement and financial management (FM) capacity and risk assessment for SED, reviewing the organizational structure for implementing the Project and the need for dedicated procurement and FM staff within the PMU. Because SED has no prior experience with WB financed projects, public procurement will be challenging, but adherence to WB procurement rules and practices will help mitigate the risk to implementation. Furthermore, SED is not familiar with the fiduciary reporting requirements of the WB, including maintaining and operating designated accounts. Capacity will have to be built from the ground up, and will require strong implementation support from the WB team. Under the WB's Procurement Framework, a simplified Project Procurement Strategy for Development has been developed to mitigate the procurement risk. A Financial Management Action Plan has been agreed to mitigate the FM risk. The Project will also mitigate fiduciary risk by working closely with both provincial and federal authorities, and Component 4 will support greater transparency through capacity building and exposure to global solutions. The fiduciary risk is rated as Substantial.



VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

Project Economic Analysis

36. **The economic analysis confirms net economic benefit from all three project components.** The economic rate of return (ERR) and net present value (NPV) of the benefits for each component are calculated using standard cost-benefit methodology.²⁰ For Components 1 and 2, the counterfactual is the marginal generation source (heavy fuel oil- and LNG-based plants).²¹ For Component 3, the counterfactual is the energy produced from household diesel generators and unserved electricity demand currently met by such sources as kerosene lamps, candles, and battery torches. The economic analysis indicates that the Project's components are viable even without factoring in the environmental benefits. The total lifetime GHG emissions avoided from the Project are approximately 1,079,293 tons of carbon dioxide equivalent (CO₂e). Table 1 shows the breakdown of the net benefits per component. According to the approach for climate co-benefits assessment laid out in the 2016 Joint Report on MDBs' Climate Finance,²² the Project can claim 100 percent climate co-benefits as it is a Category 1.1 Renewable Energy Solar Project.

Table 1: Summary of economic analysis

	50 MW Solar Plant ²³	20 MW Distributed Solar	Solar home systems ²⁴
ERR	11.7%	20.5%	17.1%
ERR including GHG emissions	16.7%	27.7%	-
Net economic benefits (with externalities)	US\$51.1 million	US\$33.0 million	US\$97.6 million

Project Financial Analysis

37. **The Project is financially feasible for both Components 1 and 2.**²⁵ The initial 50 MW solar plant under Component 1 assumes a debt-to-equity ratio of 75:25 and access to non-recourse project financing through international finance institutions. The analysis of the feasibility of the solar plant was based on the cost estimation from a prefeasibility study already carried out, and the plant capacity factor specific to the region. The equity internal rate of return (IRR) for the solar plant is 15 percent for an EPA price of

²⁰ The full economic and financial appraisal is available as part of the project documents.

²¹ Based on Merit Order Dispatch from NEPRA and Generation Mix of Pakistan.

²² European Investment Bank. 2016. "Joint Report on Multilateral Development Banks' Climate Finance." <http://www.eib.org/attachments/press/2016-joint-report-on-mdbs-climate-finance.pdf>.

²³ The analysis is based on the 50 MW pilot project. The results can be applied to the remaining 350 MW.

²⁴ The analysis took a 'willingness to pay' approach to calculate the economic benefits. Customers were assumed to pay US\$10 per month for different energy options (lanterns, candles, etc.). The service from existing energy options is different from service from SHSs. Therefore, existing options are not treated as counterfactuals and GHG assumptions are not applied to them.

²⁵ Financial analysis was not carried out for Component 3 because it is not relevant at the household level.



US\$0.04 per kWh against a weighted average cost of capital (WACC) of 7.6 percent. For the distributed solar under Component 2, assuming 100 percent debt financing by the IDA credit and an avoided cost of grid electricity of US\$0.16 per kWh, the financial internal rate of return (FIRR) is estimated at 22.3 percent against a WACC of 3.3 percent. The financial NPV of this component is US\$26.7 million, which can be offset against electricity bills.

Sensitivity Analysis

38. **A sensitivity analysis was conducted to assess the impact of changes in the main parameters on the project's economic and financial analysis.** For Components 1 and 2 the switching values of capital expenditure (CAPEX) that make the investments economically unviable are US\$1.5 per Watt and US\$2.1 per Watt respectively. In the absence of blended finance (at 4 percent interest) for Component 1, the investment is still financially feasible for a cost of debt up to 7.5 percent. Component 2 ceases to be financially feasible when the avoided electricity tariff falls below US\$0.119 per kWh, which is highly unlikely, and this does not take into account the likely continued reductions in the cost of solar power over time.

B. Technical

39. **The Project has been designed under a framework approach based on concepts that have been successfully applied in other countries and WB-financed projects.**²⁶ Furthermore, solar power is now a mature technology, and under all components high standards would be applied to products/equipment for vendor qualification. For the initial 50 MW sub-project under Component 1, a feasibility study will be completed to assess the project area and prepare the bidding package, including an ESMP and grid integration study. Future solar parks under Component 1 will be identified through a comprehensive locational analysis, with feasibility studies and ESMPs commissioned by SED for each solar park developed and as part of the bidding package for private developers. For Component 2, SED will develop portfolios of public sector buildings in consultation with other GoS departments, which will be appropriately surveyed to assess space, shading, and loading constraints. A study published by the WB in June 2016 identified significant potential for rooftop and ground-mounted installations on and around a relatively small number of public buildings in Karachi,²⁷ suggesting very significant overall potential. In addition to meeting the relevant International Electrotechnical Commission technical standards for solar PV equipment and NEPRA's grid code requirements for interconnection at the distribution level, installations will adhere to international and local building code regulations in relation to rooftop static and dynamic loading requirements. For Component 3, SSPs would be prequalified against objective criteria before being allowed to participate in the competitive bidding process to obtain the right to service prioritized

²⁶ A more detailed description of the technical design, including breakdown of cost by component, is available as part of the project documents.

²⁷ World Bank. 2016. "Demand for Distributed Renewable Energy Generation." Washington, DC. <http://pubdocs.worldbank.org/en/651451464210676719/Report-Demand-Distributed-Renewable-Energy-Generation-Pakistan-Elan-Partners-World-Bank-Jun2016.pdf>.



areas and obtain partial grants for SHS sales made within those areas. For all three investment components, stringent technical criteria for product/system quality will be applied, including adherence to the relevant international standards and testing procedures. Spot inspections and product testing will be used to ensure compliance.

C. Financial Management

40. **The FM arrangements of SED were reviewed during preparation to assess the risks and develop mitigation measures.** Subject to the recommended mitigation measures and action plan (described in Annex 1) being implemented by SED, according to the agreed timeframe, the Project has met the minimum FM requirements in accordance with the WB's Investment Project Financing Policy. The FM arrangements provide reasonable assurance that the financing proceeds will be used for the intended purposes, with due attention to the principles of economy, efficiency, effectiveness, transparency, and accountability, to support implementation and achieve the desired results. Further, this objective will be sustained by ensuring that strong FM systems are maintained for the Project throughout its duration. Detailed FM reviews will be carried out regularly, either within the regular proposed supervision plan or on a more frequent schedule if needed, to ensure that expenditures incurred by the Project remain eligible.

D. Procurement

41. **SED will follow the WB procurement regulations and systems for the Project, including those for any eligible expenditures under retroactive financing.** Procurement for the Project will be carried out in accordance with the WB's Procurement Regulations for Borrowers for Goods, Works, Non-Consulting and Consulting Services dated July 1, 2016 (Procurement Regulations) and revised November 2017. The Project will be subject to the WB's Anti-Corruption Guidelines, dated October 15, 2006, and revised in January 2011 and July 2016. A Project Procurement Strategy for Development has been prepared, which will inform the overall procurement and contract management approach. The WB's planning and tracking system, Systematic Tracking of Exchanges in Procurement, will be used.

E. Social (including Safeguards)

42. **The Project is expected to have highly positive direct and indirect social impacts, including improved electricity supply, increased electricity access, and employment generation.** Energy, and in particular lack of availability of or access to electricity, is a highly sensitive issue in Pakistan because of the negative impact on standards of living and livelihoods, particularly during the summer months. Even relatively low levels of power consumption can have substantial social benefits, including evening lighting, cooling, and provision of mobile charging and entertainment. The Project is likely to result in significant employment generation, including construction jobs under Components 1 and 2, followed by a smaller number of long-term jobs associated with O&M activities. For Component 3, SSPs are likely to create new jobs in SHS distribution and installation, including in remote areas, and there is substantial opportunity to promote female employment (direct and indirect) through training and incentives.



43. **In terms of negative social impacts, the Project does not anticipate acquiring private land; most impacts identified are moderate in nature and intensity and can be mitigated.** An Environment and Social Management Framework (ESMF), which includes a Resettlement Policy Framework (RPF), has been prepared and was publicly disclosed on April 9, 2018 on the SED and WB websites, identifying the generic social impacts of the Project and mitigation measures. Solar parks under Component 1 may put additional pressure on local resources, particularly on drinking water. There may also be impacts from labor influx—for example, impacts on the privacy of women, health and safety risks for the community and the construction workers, and possible livelihood losses. Although an RPF has been prepared, no land acquisition is expected since the Project would use GoS-owned land, with checks in place to ensure that any land selected is free of squatters, encroachers, and other claims or encumbrances. Component 2 may pose health and safety risks for building occupants as well as for the construction workers, and water requirements during plant operation.²⁸ Some buildings may have historical significance and be protected under provincial cultural heritage laws, although such buildings will be avoided where possible. Component 3 is likely to cause only minor social impacts, such as damage to rooftops from SHS installation. Mitigation measures include commissioning an ESMP for any relevant subproject (e.g., a solar park) and adhering to the WBG’s Environment, Health, and Safety Guidelines and the Guidance Note on Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx.

F. Environment (including Safeguards)

44. **The Project will lead to substantial direct environmental benefits by increasing the deployment of renewable energy.** In addition, building supply chains and experience in the sector is likely to yield indirect benefits through continued cost reductions, leading to additional solar power deployment outside of the Project. Transitioning to a higher percentage of renewable energy in the electricity mix has benefits for Pakistan’s GHG emissions, air and water pollution, and use of water resources.

45. **The Project has some negative environmental impacts, but they are not expected to be significant or irreversible.** Since the exact locations and nature of the solar parks and distributed solar sites under the Project are not known at this stage, the ESMF highlights the generic environmental impacts of the Project. Component 1 is likely to have some negative impacts on local air quality, soil and water resources, noise pollution, existing infrastructure, natural vegetation and habitat, and wildlife, and to entail the potential environmental aspects of labor influx. However, most of these potential impacts are low to moderate in intensity/significance and are reversible and localized in nature, and therefore can be easily mitigated. Similarly, Component 2 could have impacts on air, soil, and water, and result in noise generation, blockage of building access routes, damage to the buildings and other infrastructure, and increased water requirements. The impacts of Component 3 could include minor damage to houses, noise, and battery disposal issues, although SSPs have an economic incentive to ensure battery collection and recycling. Most of these impacts are mild in nature and intensity and can therefore be addressed through

²⁸ Although most distributed solar systems rely primarily on dry cleaning methods, such as manual sweeping.



simple mitigation and precautionary measures.

46. **Risks due to climate change impacts include inundation and strong winds, and these will need to be addressed in the design specifications under each Component.** The climate change risks in Sindh Province were assessed through the WB's Climate and Disaster Risk Screening Tool, and two main risks identified were: (i) Inundation, due to extreme precipitation, projected sea-level rise and storm surge, and relevant to Components 1, 2 (ground-mounted solar installations), and 3 (especially coastal villages); and (ii) Strong winds, relevant to Component 2 (rooftop installations). These risks are already well understood and dealt with in Pakistan, although the Project will need to factor in potentially higher frequency and severity of such events.

G. Gender

47. **Pakistan suffers from one of the lowest gender equality performance indicators worldwide.**²⁹ In 2013, female-headed households (FHHs) made up 10.6 percent of all households in Pakistan, although the figure is 1.6 percent in rural Sindh.³⁰ Unfortunately gender disaggregated data on electricity access is severely lacking, in part due to the general uncertainties on rates of electricity access. This data gap is a significant constraint on the ability of the Project to incorporate gender considerations into the detailed design, and will be tackled in the early stages of implementation. However, research indicates that FHHs in Pakistan allocate a higher share of their budget/expenditure on fuel and lighting than non-female headed households.³¹ Compounding the issue, less than 5 percent of women are included in the formal financial sector, compared to South Asia's average of 37 percent.³² This implies that FHHs are likely to benefit most from a SHS, but are least able to afford them (Endowment Gap – Access to Electricity). In addition, there is an extremely low representation of women in the energy industry (for example, they are 1 percent of utilities' workforce), and the country lacks in the ability to implement gender mainstreaming activities, especially for larger energy infrastructure projects (Jobs/Livelihood Gap).³³

²⁹ Ranking 143rd (out of 144 countries) according to the Global Gender Gap Report 2016 (quantifying the magnitude of gender disparities) and 146th (out of 188 countries) according to the UN Gender Inequality Index. World Economic Forum. 2016. "Global Gender Gap Report" Geneva, Switzerland. <http://reports.weforum.org/global-gender-gap-report-2016/> & UNDP. 2016. "UN Gender Inequality Index" New York, NY. <http://hdr.undp.org/en/content/gender-inequality-index-gii>

³⁰ World Bank. 2018. "Female-headed households: Pakistan (2013)". <https://data.worldbank.org/>

³¹ <http://www.pide.org.pk/psde/pdf/AGM28/Ashfaq%20H%20Khan%20and%20Umer%20Khalid.pdf>

³² World Bank. 2016. "Pakistan's Financial Access Statistics". Washington, DC.

³³ ESMAP. 2017. "Gender program on Social Inclusion in the Energy Sector", World Bank. 2017. "Getting to gender equality in energy infrastructure: lessons from electricity generation transmission, and distribution projects." Washington, DC. <http://documents.worldbank.org/curated/en/930771499888717016/Getting-to-gender-equality-in-energy-infrastructure-lessons-from-electricity-generation-transmission-and-distribution-projects> & World Bank. 2013. "Pakistan Enterprise Survey"



48. **The first priority of the Project is to address the data gap through a comprehensive household energy survey, which will help improve the understanding of gender gaps in access to electricity in Sindh Province.**³⁴ Over 600,000 women and girls can potentially benefit from improved electricity access under the Project assuming an equal distribution of benefits between men and women. However, the improved data from the household energy survey will guide SED's efforts to target women and girls, and specifically FHHs, for adoption of SHS under Component 3 (Endowment Gap - Access to Electricity). The Project will (i) identify priority communities for the grants that will be provided (including areas with high percentages of FHHs); (ii) explore differentiated grant amounts/financing options (for example in the case of FHHs); and (iii) hold consumer awareness raising and financial literacy activities targeting women so that they are more informed about the SHS program, including through local media outlets, roadshows and market events, household visits, and flyers). The Project will also put in place measures to encourage female employment opportunities (Jobs/Livelihood Gap). At least one training event targeting women and disabled people will be organized to support recruitment of these groups by SSPs, and SED-issued contracts for the household energy surveys will require qualified firms to have at least 15 percent women and/or disabled persons on their teams, in line with a GoS quota. This will also facilitate having sufficient female staff on the survey teams (paired with men for their safety and security), which will help ensure that women within households and FHHs are adequately surveyed. The Project will work with a gender specialist to design and provide the training and other support under Component 4. Finally, the recruitment of staff for the PMU will be carried out to maximize female and disabled person participation in the application process through targeted job advertisements and the use of social media, with the objective of meeting the GoS quota for 15 percent of new staff to be female and/or disabled.

49. **The results indicators will help to capture the outcomes from the above objectives and activities.** The Project will target an SHS adoption rate by FHHs of 2 percent under Component 3, which is slightly higher than the proportion of FHHs (1.6 percent) in rural Sindh. The baseline and target will be updated once the household energy survey is complete to better reflect the situation in Sindh and in the target areas. The Project also includes a series of intermediary results indicators to capture the targets outlined in the paragraph above on female training and employment.

H. Citizen Engagement

50. **Citizen engagement runs across the Project, and will help improve the data gathering and consumer feedback to inform detailed design and implementation.** Initial citizen engagement has already been carried out through the ESMF and through a workshop held in August 2017 focusing on Component 3. To provide continuous citizen engagement at the Project level, the PMU will invite an 'advocate' for citizens/consumer views and concerns to the Project Steering Committee. For the solar

Washington, DC. <http://www.enterprisesurveys.org/data/exploreeconomies/2013/pakistan>

³⁴ The household energy survey will be carried out (as described in Paragraph 34) at the start and towards the end of the implementation period, which will be combined with the data from the 2017 Census to build a more complete picture of electricity access in Sindh Province, and the gender gaps that exist.



parks developed under Component 1, the ESMP developed for each site includes provisions for obtaining citizen engagement. There will also be substantial and ongoing engagement under Component 3, including the consumer awareness-raising campaign, an M&E program that includes consumer follow-up, product testing, and a helpline to report concerns or complaints regarding SSPs. A social audit will be carried out at the mid-term point of the Project to ascertain social inclusion, citizen engagement and overall community satisfaction under Component 3. The household energy survey commissioned under Component 4 will help ensure a better understanding – disaggregated by gender – of consumer requirements, product preferences, and affordability, and will include community outreach and/or focus groups to better understand specific issues and test out different design and product options. The citizen engagement measures are captured in three of the intermediary results indicators.

I. World Bank Grievance Redress

51. **Communities and individuals that believe that they are adversely affected by a project supported by the WB may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service**, which ensures that complaints are promptly reviewed and project-related concerns addressed. Project-affected communities and individuals may submit a complaint to the WB's independent Inspection Panel, which determines whether harm occurred, or could occur, as a result of the WB's noncompliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the WB's attention and WB Management has been given an opportunity to respond. For information on how to submit complaints to the WB's corporate Grievance Redress Service, please visit <https://www.worldbank.org/GRS>. For information on how to submit complaints to the WB Inspection Panel, please visit <https://www.inspectionpanel.org>.



VII. RESULTS FRAMEWORK AND MONITORING

Results Framework

Project Development Objective(s)

The Development Objective is to increase solar power generation and access to electricity in Sindh Province.

PDO Indicators by Objectives / Outcomes	DLI	CRI	Unit of Measure	Baseline	Intermediate Targets				End Target
					1	2	3	4	
Increase solar power generation in Sindh Province									
Generation capacity of energy constructed or rehabilitated		Yes	Megawatt	0.00	1.00	53.00	106.00	260.00	420.00
Renewable energy generation capacity (other than hydropower) constructed under the project		Yes	Megawatt	0.00	1.00	53.00	106.00	260.00	420.00
Utility-scale solar power generation capacity constructed under the project			Megawatt	0.00	50.00	100.00	250.00		400.00
Distributed solar power generation capacity constructed under the project			Megawatt	0.00	1.00	3.00	6.00	10.00	20.00
Increase access to electricity in Sindh Province									
People provided with new or improved electricity service		Yes	Number	0.00	180,000.00	420,000.00	720,000.00	1,140,000.00	1,200,000.00



PDO Indicators by Objectives / Outcomes	DLI	CRI	Unit of Measure	Baseline	Intermediate Targets				End Target
					1	2	3	4	
People provided with access to electricity under the project by household connections (grid or off-grid).		Yes	Number	0.00	180,000.00	420,000.00	720,000.00	1,140,000.00	1,200,000.00

Intermediate Results Indicators by Components	DLI	CRI	Unit of Measure	Baseline	Intermediate Targets				End Target
					1	2	3	4	
Component 1: Utility-Scale Solar									
Completion of competitive bidding process for awarding the first 50 MW sub-project			Yes/No	N					Y
Private capital mobilized			Amount(US D)	0.00	34,187,500.00				273,500,000.00
Component 2: Distributed Solar									
Identification of at least 1 MW of distributed solar PV and competitive bidding completed			Yes/No	N					Y
Component 3: Solar Home Systems									
Female-headed households provided with solar home systems			Number	0.00	600.00	1,400.00	2,400.00	3,800.00	4,000.00



Social Audit conducted at mid-term and results incorporated into project		Yes/No	N					Y
Component 4: Capacity Building and Technical Assistance								
Consumer Advocate added to Project Steering Committee		Yes/No	N					Y
Female and/or disabled staff within household energy survey contractor firm		Percentage	0.00	15.00				15.00
Female and/or disabled staff within the PMU		Percentage	0.00	15.00	15.00	15.00	15.00	15.00
Training event for women and/or disabled people held		Yes/No	N					Y
Improved data on energy access in Sindh Province		Yes/No	N	Y				Y

Indicators to be mapped	DLI	CRI	Unit of Measure	Baseline	End Target
PDO Indicators					
Private Capital Mobilization			Amount(USD)	0.00	273,500,000.00
Intermediate Outcome Indicators					
Completion of a comprehensive household energy survey to inform prioritization and targeting of Component 3, including on gender impacts			Yes/No	N	Y



Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Generation capacity of energy constructed or rehabilitated
Definition/Description	
Frequency	Assessed half-yearly.
Data Source	Refer to utility-scale and distributed solar indicators.
Methodology for Data Collection	Refer to utility-scale and distributed solar indicators.
Responsibility for Data Collection	PMU to obtain data from solar power developers and report to WB.
Indicator Name	Renewable energy generation capacity (other than hydropower) constructed under the project
Definition/Description	
Frequency	Assessed half-yearly.
Data Source	Refer to utility-scale and distributed solar indicators.
Methodology for Data Collection	Refer to utility-scale and distributed solar indicators.
Responsibility for Data Collection	PMU to obtain data from solar power developers and report to WB.



Indicator Name	Utility-scale solar power generation capacity constructed under the project
Definition/Description	Capacity of solar power (in MW) installed under Component 1.
Frequency	Assessed half-yearly.
Data Source	Quarterly report(s) submitted by solar power developers.
Methodology for Data Collection	Sum of total MW installed.
Responsibility for Data Collection	PMU to obtain data from solar power developers and report to WB.
Indicator Name	Distributed solar power generation capacity constructed under the project
Definition/Description	Capacity of solar power (in MW) installed under Component 2. Intermediate targets are cumulative.
Frequency	Assessed half-yearly.
Data Source	Quarterly report(s) submitted by EPC contractor(s).
Methodology for Data Collection	Sum of total capacity installed.
Responsibility for Data Collection	PMU to obtain data from contractors and report to WB.



Indicator Name	People provided with new or improved electricity service
Definition/Description	
Frequency	Assessed quarterly.
Data Source	Installation records provided by Solar Solution Providers. Real-time reporting will be used if possible.
Methodology for Data Collection	Calculation of total households actively using a SHS, multiplied by the average household size (6 persons).
Responsibility for Data Collection	PMU to provide data to WB.
Indicator Name	People provided with access to electricity under the project by household connections (grid or off-grid).
Definition/Description	
Frequency	Assessed quarterly.
Data Source	Installation records provided by Solar Solution Providers. Real-time reporting will be used if possible.
Methodology for Data Collection	Calculation of total households actively using a SHS, multiplied by the average household size (6 persons).
Responsibility for Data Collection	PMU to provide data to WB.



Monitoring & Evaluation Plan: Intermediate Results Indicators

Indicator Name	Completion of competitive bidding process for awarding the first 50 MW sub-project
Definition/Description	Completion of a transparent and competitive process for awarding the tariff of the first 50 MW solar project (solar auction).
Frequency	Assessed on completion.
Data Source	Results of the selection committee.
Methodology for Data Collection	Not applicable.
Responsibility for Data Collection	PMU to disclose winning bidder and report to WB.



Indicator Name	Private capital mobilized
Definition/Description	The project design assumes that private sector solar power developers will arrange commercial financing for the sub-projects that they construct and own, thereby leading to the mobilization of private capital that far exceeds the public funding used to develop solar parks and support solar auctions.
Frequency	Upon RFP completion for each Solar Park.
Data Source	RFP bidding documents from winning vendor.
Methodology for Data Collection	Sum of equity and debt financing for each sub-project.
Responsibility for Data Collection	PMU to collect data and report to WB.



Indicator Name	Identification of at least 1 MW of distributed solar PV and competitive bidding completed
Definition/Description	Identification of a portfolio of buildings with a combined capacity of at least 1 MW, with agreements in place with relevant government departments, and completion of competitive bidding for identifying the developer(s) for installation and O&M.
Frequency	Assessed on completion.
Data Source	PMU to provide verification that a winning bidder has been selected.
Methodology for Data Collection	Assessed as successful once bidding is completed for at least 1 MW.
Responsibility for Data Collection	PMU to provide data to WB for verification.



Indicator Name	Female-headed households provided with solar home systems
Definition/Description	Female-headed households provided with solar home systems under Component 3. This indicator is based on the assumption that around 1.6% of total rural households in Sindh are headed by women, and that through a combination of targeting and potentially a higher grant amount, they can be reached and incentivized to procure a SHS from a SSP. The household energy survey to be carried out at the start of the project will provide further data to help inform this gender-related objective, and any modifications to the targets that may be required. Intermediary targets are cumulative.
Frequency	Assessed quarterly.
Data Source	Quarterly reports submitted by SSPs.
Methodology for Data Collection	SSPs will be required to identify female-headed households using pre-defined criteria, and will be independently verified by the M&E consultants..
Responsibility for Data Collection	PMU to collate data and report to WB.



Indicator Name	Social Audit conducted at mid-term and results incorporated into project
Definition/Description	Social Audit (also called social accounting) is a monitoring process through which organizational or project information is collected, analyzed, and shared publicly in a participatory fashion. Community members conduct investigative work at the end of which findings are shared and discussed publicly.
Frequency	Assessed on completion.
Data Source	Final social audit report by contracted firm.
Methodology for Data Collection	Assessed as completed once social audit is written up and published.
Responsibility for Data Collection	PMU to provide data for verification by WB.
Indicator Name	Consumer Advocate added to Project Steering Committee
Definition/Description	To provide citizen engagement at the Project level, the PMU will invite an “advocate” for citizens/consumer views and concerns to the Project Steering Committee.
Frequency	Assessed annually.
Data Source	Steering Committee minutes.
Methodology for Data Collection	PMU to provide evidence of consumer advocate participation.
Responsibility for Data Collection	PMU to provide minutes for WB to verify.



Indicator Name	Female and/or disabled staff within household energy survey contractor firm
Definition/Description	Firm(s) contracted to carry out the household energy survey at the start and end of the project to have at least 15% female and/or disabled staff on the team working on the assignment. This will also facilitate the surveying of women within households.
Frequency	Assessed at start and end of the contract with the firm(s) involved.
Data Source	Staff roster provided by contracted firm(s).
Methodology for Data Collection	List of project staff and gender of each staff member.
Responsibility for Data Collection	PMU will collect data and report to WB.
Indicator Name	Female and/or disabled staff within the PMU
Definition/Description	PMU hires at least 15% female and/or disabled staff, in line with Government of Sindh recruitment objectives.
Frequency	Assessed once PMU is fully constituted and then annually.
Data Source	PMU staff roster.
Methodology for Data Collection	Assessment of staff roster provided by PMU.
Responsibility for Data Collection	PMU to maintain accurate staff roster and report to WB.



Indicator Name	Training event for women and/or disabled people held
Definition/Description	Training event for women to support recruitment of women by solar solution providers (SSPs)
Frequency	Assessed on completion.
Data Source	Event invitation and participation lists.
Methodology for Data Collection	Confirmation of event being held.
Responsibility for Data Collection	PMU to provide data to WB upon completion.



Indicator Name	Improved data on energy access in Sindh Province
Definition/Description	Comprehensive data on energy access in Sindh Province is available in compliance with the Multi-Tier Framework (MTF) for assessing energy access. This should include detailed gender-disaggregated data to help inform the targeting of female-headed households, and ensure overall project success by better understanding the needs of women and girls, and using this data to inform the targeting of households and the data provided to SSPs.
Frequency	Assessed at mid-term review and end of the Project.
Data Source	Household energy surveys to be commissioned under the Project, combined with Pakistan Census data and other reliable sources of data on energy access.
Methodology for Data Collection	Methodology provided by the MTF for carrying out household energy surveys and reporting of results.
Responsibility for Data Collection	PMU responsible for collating energy access data and making it publicly available.



ANNEX 1: IMPLEMENTATION ARRANGEMENTS AND SUPPORT PLAN

Project Institutional and Implementation Arrangements

1. **SED is the final recipient of the loan, and the PMU will be in charge of Project implementation.** The PMU will hire staff and consultants for the FM, safeguards, procurement, and technical aspects of the Project, on the basis of the PMU budget developed by SED. The roles and responsibilities of such staff/consultant(s) will be set out in detailed terms of reference to be agreed by the WB. Based on SED's experience with the Sindh Transmission & Dispatch Company and other publicly owned companies, SREC will be the holding company responsible for SPVs created under the Project to own and manage public assets under Components 1 and 2.
2. **SED will require technical support as well as capacity building on social safeguards aspects.** The PMU will be responsible for the implementation of the ESMF and all ESMP development tasks and cross-agency coordination, and will be tasked with day-to-day ESMF/ESMP-related activities. The PMU Project Director will be assisted by an environmental and social development specialist and by individual consultants as needed. The PMU will engage a consulting firm to prepare ESMPs for individual subprojects. It will also engage M&E consultants to monitor the progress of the Project and evaluate the impacts, including environmental and social issues, upon completion. ESMP consultant firms will prepare quarterly reports covering the implementation of the ESMF and the preparation and implementation progress of each ESMP. Capacity building will be needed to ensure that the ESMF/ESMP objectives, procedures, and roles and responsibilities of various entities are well understood and are being implemented. Training under Component 4 will support this objective.
3. **For each component there will be a specific implementation strategy.** Component 1 will be implemented by the PMU, which will either take on the role of solar park manager or hand it to a specially created SPV. Component 2 will be implemented by the PMU, with the distributed solar assets and management of the O&M contract potentially handed to an SPV created under SED. Component 3 will be implemented by the PMU, with SSPs responsible for selling SHSs to households. An Operations Manual will be developed to help guide SED and the PMU in procedures, reporting mechanisms, and M&E activities in relation to Project implementation.

Financial Management

4. **FM will use country systems and procedures.** The PMU will be responsible for the execution and implementation of the Project, including management of and reporting on the fiduciary aspects, including FM, disbursements, audits, and procurement. SED uses manual processes with redundant steps based on rules from 1962 that cause delays in budget execution, and this will need to be addressed under the Project.
5. **Planning and budgeting.** As part of the Public Sector Development Program, the Project will be



reflected in the Federal Government's capital budget.³⁵ GoS follows a budget call circular that includes detailed instructions on preparing a comprehensive budget in time for approval by the Legislature. The Project will be included in the SED development-capital sub-fund sub-elements budget using the detailed object and functional classification prescribed in the New Accounting Model. The Project's budget will be prepared using function and object codes of the Chart of Accounts to capture expenditures for identified schemes and assets to be procured under the components, including the capacity building under Component 4.

6. **The Accountant General (AG) Office for Sindh Province will capture and track development expenditure through project coded numbers identified in the Annual Development Plan.** The Chart of Accounts is flexible enough to capture and report project transactions. The AG Office exercises budgetary controls through the Financial Accounting and Budgeting System (FABS). The PMU will approach the Controller General of Account (CGA) for the provision of a FABS terminal for the maintenance of the Designated Account (DA).

7. **The GoS has a comprehensive internal control framework comprising the Sindh General Financial Rules, Treasury Rules, and Sindh Delegation of Financial Powers Rules.** SED will observe this framework for Project expenditure. At present, SED has no internal audit section. The Project will support the establishment and functioning of an Internal Audit Wing in SED to cover donor-funded projects and submit quarterly internal audit reports to the Departmental Internal Audit Committee, with copies provided to the WB.

8. **A segregated DA in US dollars would be established in the National Bank of Pakistan for the IDA credit** in accordance with agreed procedures for the operation of DAs. Disbursements will be made quarterly on the basis of reports.

9. **Monthly civil accounts are published by the CGA within 15 days after the end of each month.** Semiannual Interim Unaudited Financial Reports (IUFRs), including cash forecasts for two quarters, in a format agreed with the WB, will be submitted to the WB within 45 days after the end of each calendar semester. The PMU will maintain books of accounts for Project-related activities in accordance with the accounting procedures and policies defined in the New Accounting Model. The Project's financial reports will identify the use of funds according to predefined eligible expenditures to be financed by the WB. The reports will include adequate notes and disclosures consistent with acceptable international practice.

10. **External audit of the Project will be conducted for the PMU by the Auditor General of Pakistan (AGP).** In addition to the audited financial statement, the PMU will provide an assertion that funds have been used for the intended purposes. For each financial year closing on June 30, acceptable audited financial statements of the Project, along with a Management Letter, will be submitted to the WB by December 31 (i.e., within six months after the close of the financial year).

11. **Implementation support is expected to entail two missions per year during the first two years**

³⁵ The capital budget is intended for development projects in the country. The capital expenditure is generally met from the revenue surplus, reserve funds, and borrowings for specific or general purposes.



of operation; thereafter frequency will depend on the updated project FM risk assessment and progress in building FM capacity. The scope of the supervision is left to the professional judgment of the FM specialist. It may cover the following: (a) review of SED's continuous maintenance of an adequate FM system; (b) review of selected transactions, as deemed necessary; (c) follow-up on the timeliness of FM reporting and actions taken on issues raised by external auditors; (d) review of Project financial reports; (e) follow-up on the status of agreed actions; and (f) review of compliance with the financial covenants.

Financial Management Action Plan

12. **SED and the PMU will ensure the implementation of the action plan outlined in Table A1.**

Table A1: Financial Management Action Plan

Significant weaknesses	Action	Completion date
1. Transaction entry and authorization centralized at AG Office causes delays in payments.	SAP-FABS terminal and end-user devices (desktop, printer, scanner, Uninterrupted Power Supply) installed at the PMU and experienced user seconded by CGA. All Project transactions will be processed and authorized at the PMU and payment from the Assignment Account will be made direct to vendors without recourse to endorsement at AG Office.	30 days after effectiveness date
2. No internal audit arrangements.	Internal Auditor technical assistance will be provided under Component 4. The Internal Audit Wing will prepare an annual audit plan that will include the Project scope, and a quarterly internal audit of the Project will be submitted to the WB.	30 days after effectiveness date
3. Lack of professionally qualified staff in the Admin and Finance Section.	AGP to deputize a suitably qualified and experienced staff familiar with WB disbursement, FM, and procurement procedures as Project accountant.	60 days after effectiveness date
4. Second Superintendent position is vacant.	Fill second Superintendent position to ensure proper segregation of duties.	60 days after effectiveness date
5. The Sindh Directorate of Alternate Energy audit reports for 2014-15 and 2015-16 are yet to be issued as of the time of the assessment in August 2017.	2014-15 and 2015-16 audit to be completed.	By date of effectiveness

Disbursement

13. **Disbursements will be made quarterly on the basis of reports.** Advances will be provided for the following six months based on the budgeted/forecast expenditures for that period. Subsequent IUFRs will document expenditures against the advance received and provide forecast expenditures for the following six months, on the basis of which the amount of funds to be disbursed will be determined. Retroactive financing up to a maximum amount of SDR13,920,000 is permitted for the financing of eligible expenditures incurred for the Project on or after December 18, 2017, until the date of the Financing



Agreement.

Procurement

14. **A Procurement Plan has been prepared that will set out the selection methods to be followed by SED during Project implementation.** The plan will cover the procurement of goods, works, and non-consulting and consulting services financed by the WB. It will represent the first 18 months of Project implementation and will be updated at least annually or as required to reflect the actual Project implementation needs and improvements in institutional capacity, through the Systematic Tracking of Exchanges in Procurement planning and tracking system.

15. **Once selected, firms may procure the goods, works, non-consulting services, and/or consulting services required to undertake their commitment/investment from eligible sources, using their own procedures.** The transactions under Component 1 are likely to be facilitated by professional transaction advisors that the PMU will procure using Quality- and Cost-Based Selection. The developers of solar power projects under Component 1 would be competitively selected in accordance with the WB's procurement policies. Additionally, the Project may include public investments in related infrastructure for power evacuation and grid upgrades, to prepare sites for private sector investment. These investments will be subject to appropriate procurement processes under the WB's Procurement Regulations (2016).

16. **The WB will support procurement implementation through two missions per year during the first two years of operation.** The frequency of implementation support for procurement will depend on the progress of capacity building in the implementing agencies. Procurement post-reviews will be conducted at least annually by the WB or by consultants or audit agencies acceptable to the WB.

Environmental and Social (including safeguards)

17. **Since the exact scope and locations relating to each component are not known at this stage, a framework approach has been adopted for environmental and social assessment.** An ESMF and RPF have been prepared, and site-specific ESMPs will be prepared during project implementation.

18. **Screening process.** The initial screening was done through reconnaissance site visits and completion of checklists. The ESMF specifies the type and extent of environmental and social assessment that will need to be carried out, with the help of checklists, before subprojects are initiated. If the screening concludes that the subproject is likely to have significant and/or irreversible negative environmental or social impacts, the subproject will be excluded from the Project. If the subproject is likely to have low to moderate negative impacts, an ESMP will be prepared before the subproject is initiated. For subprojects that will potentially cause low levels of environmental or social impacts, the only assessment required will be the screening carried out with the help of checklists. The checklists and ESMPs prepared for various subprojects will be reviewed by the Project environmental and social development specialist(s). The first two ESMPs and the first two checklists of each subproject type will be shared with the WB for their review and clearance. After the WB experts have provided their guidance/input, the subsequent ESMPs and checklists may be reviewed by the PMU's environmental and social development specialist(s) and cleared by the Project Steering Committee. They should also be shared with the WB.

19. **Mitigation measures.** For the three components, mitigation measures will include tree plantation, evaluation of the structural integrity of physical cultural resources, mandatory compliance with



environmental code of practices (covering waste, fuels and hazardous goods, water, drainage, soil, erosion, soil management, etc.), strict adherence to work timings, and preparation of site-specific waste and traffic management plans. Noise will be kept within the permissible limits by using noise abatement devices and barriers, and high-noise activities will be restricted to normal working hours only. It will be ensured that waste from construction activities is not released into any surface or groundwater source. Special care will be taken to keep fuels, lubricants, and chemicals in specially designated areas to avoid soil contamination. The WBG's environmental health and safety guidelines will be implemented. Land may be required on a temporary or small-scale basis, and to facilitate this an RPF has been prepared. RAPs will be prepared to ensure that people are compensated where required. Screening will also be undertaken for impacts on old buildings. Labor issues will be stringently monitored by the Project, and contracts will include specific clauses requiring compliance with Pakistan's labor laws. If buildings selected for distributed solar power generation are protected under the Sindh Cultural Heritage Act of 1994, a Physical Cultural Resources Management Plan will be prepared for such subprojects in accordance with the Bank's OP 4.11, *Physical Cultural Resources*, and the Sindh Cultural Heritage Act of 1994.

20. **Training and capacity building.** To ensure implementation of the ESMF, PMU staff will need training and capacity building on the key environmental and social issues associated with the proposed interventions, ESMF/ESMP implementation and monitoring, and awareness-raising. The training program falls under Component 4 and is estimated at US\$100,000.

21. **Implementation.** The PMU will have overall responsibility for safeguards compliance and will include an environmental and social development specialist. Contractors commissioned under Component 1 (e.g., for solar park civil works) or Component 2 (for distributed solar installation) will be required to implement safeguard mitigation and monitoring measures on site, including employing dedicated environmental and social development specialists as part of their field teams. The implementation cost of the ESMF, which includes training, preparation of site-specific plans, and monitoring and reporting, has been estimated at US\$1.32 million and is part of Component 4.

22. **Documentation and reporting mechanism.** Quarterly M&E reports will be produced. Any major accident will be reported immediately and communicated separately. Consultations will be conducted as part of ESMP preparation and implementation.

Monitoring and Evaluation

23. **The PMU will include M&E staff/consultants, and mechanisms will be explored to provide real-time tracking of SHS installations under Component 3.** The WB team will need to intensively monitor overall performance as it will be the first time SED works with the WB. Data and statistics on actual project outputs and outcomes will be gathered, analyzed, and included in the progress reports to be submitted to the WB.

Implementation Support Plan and Resource Requirements

24. **Implementation support will begin as early as possible to prepare the Government and the implementing agencies ahead of the first disbursement.** WB team members for procurement, FM, and safeguards will be based in Islamabad to ensure timely support to the client. Formal supervision and field visits will be carried out at least twice a year. Table A2 details the Implementation Support Plan and WB resourcing requirements.



Table A2: Implementation Support Plan

Time	Focus	Skills needed	Resource estimate
First 12 months	<ul style="list-style-type: none"> - Build capacity for project management - Build capacity for procurement, FM, and safeguards 	<ul style="list-style-type: none"> - Project management - Energy expert - Procurement 	US\$175,000, including US\$30,000 of travel
12-48 months		<ul style="list-style-type: none"> - Financial management - Social and environment safeguards 	US\$215,250, including US\$30,000 of travel per year

Table A3: Summary of WB Skills Mix Requirement

Skills needed	Number of staff weeks	Number of trips
TTL	15	10
Co-TTL	15	10
Operations Advisor	8	5
Energy Expert	8	10
Financial Management	4	4
Procurement	4	4
Environmental Safeguards	4	4
Social Safeguards	4	4

PROJECT DESCRIPTION

- 1. The Project aims to support the deployment of solar power in Sindh Province spanning three market segments: utility-scale, distributed generation, and at the household level.**

Public funding shall be used to leverage private sector investment and/or expertise in the three segments, with an emphasis on long-term sustainability, developing domestic solar PV experience, and the emergence of self-sustaining markets. Although focused on Sindh Province, the Project is explicitly designed to provide national benefits by demonstrating new approaches. The Project will introduce and showcase international best practice with renewable energy auctions, reduce the headline cost of solar deployment, create sustainable business models for potential replication in other provinces, build institutional capacity, and identify opportunities for future renewable energy deployment that address issues of grid integration. In the context of potential new investment in fossil fuel-fired generation capacity, and lack of conviction over the long-term role and integration of renewable energy, the Project is designed to help steer Province towards a lower carbon path to development.

Component 1: Utility-Scale Solar (\$40 million)

- 2. Component 1 will finance a series of Solar Parks to leverage private sector development of solar PV through the use of competitive bidding, starting with an initial 50 MW project that would launch the first international solar auction in Pakistan.** The Solar Park concept helps to reduce the risk profile for private sector developers by ensuring that land is secured, permits obtained, and power off-take is pre-arranged. Solar Parks also include upfront development of shared infrastructure such as the grid connection, roads, security and water supply, which helps to reduce the capital cost for each project within the Solar Park. As a result, Solar Parks allow for a carefully planned and coordinated approach to solar deployment that helps eliminate some of the risks associated with unsolicited projects, and helps reduce the risk profile and cost of project development, leading to highly competitive power prices under competitive bidding. A 50 MW site is already identified and assessed by SED, with land secured, and will be taken forward as a pilot solar auction in the first phase of the Project. Further Solar Parks in the 50-200 MW range would be subsequently developed to facilitate a total of 400 MW of solar power capacity, following a comprehensive geospatial planning and dispatch analysis.

Component 2: Distributed Solar (\$25 million)

- 3. Component 2 will finance at least 20 MW of distributed solar PV on the rooftops and other available space on and around public sector buildings in Sindh.**

By utilizing spare rooftop and other available space on and around public buildings, the program is expected to create a win-win situation for the public sector, DISCOs, and electricity consumers by: (i) reducing recurrent expenditure on electricity by GoS, freeing up budget for other priorities; (ii) providing the DISCOs with cost-effective power during periods of high air conditioning load, while allowing the payments to be netted off against outstanding public sector debts; (iii) private sector involvement through third party contract operating large distributed solar PV installations, thereby reducing costs; and (iv) improving the supply of affordable power to consumers, without the need for ancillary transmission investment. At least 20 MW of capacity would be installed under this component, in a phased manner. SED would identify portfolios of candidate sites, and would liaise with other departments for installation of solar equipment. The portfolios would be awarded to private sector solar developers for installation under an EPC contract that includes performance-based provision for O&M or any other applicable model. The Project would initially target sites where no export of electricity is required, but could be expanded to larger sites once an agreement with the DISCO(s) is secured.

Component 3: Solar Home Systems (\$30 million)

4. **Component 3 will provide results-based grants to scale up the provision of SHS in areas with low access to electricity, reaching at least 200,000 households to achieve sustainable development goals and access to electricity for all.** Under this component Solar Home Systems will be provided to households in prioritized areas. The SHS will be procured through competitive bidding for supply & long-term O&M. Households will benefit from high quality systems. The contractors will be made committed to provide SHS along with warranties and will ensure local physical presence to ensure servicing and repairs. The component of the project would be complemented with a major public awareness-raising campaign.

Component 4: Capacity Building and Technical Assistance (\$5 million)

5. **Component 4 consists of a range of capacity building and technical assistance activities to support the design and implementation of the Project.** Through this component technical assistance and support will be provided to Energy Department, Government of Sindh and other relevant entities in Government of Sindh for introducing state of the art Solar PV based technologies available in developed countries. The expenditures funded under Component 4 will include activities such as: (i) training for SED and other GoS entities; (ii) participation in World Bank capacity building events and liaison with relevant experts; (iii) consultation with key stakeholders and community

groups (iii) Exposure to state of the art solar PV technologies available in developed countries.

ANNEXURE D1

MINUTES OF THE PRE-CDWP MEETING HELD ON 17.4.2018

Government of Pakistan
Ministry of Planning, Development & Reform
(ENERGY WING)

MINUTES OF THE PRE-CDWP MEETING HELD ON 17.04.2018

Subject: Sindh Solar Energy Project (SSEP)

A Pre CDWP-meeting was held on 17.04.2018 under the chairmanship of Member (Energy), at 10:00 am in Conference Room, 5th Floor, Energy Wing, S&T Building, G-5/2, Islamabad to discuss the subject project. The list of participants is attached.

2. It was informed that Sindh Solar Energy Project (SSEP) with capital cost (US \$ 105 million) will be financed by the World Bank 95.3% and Government of Sindh 4.7% which consists of four components. Component-1 is Utility-Scale Solar which includes development of Solar Parks to support private sector investment under IPP mode, and launching of Pakistan's first competitive bidding for solar power production, starting with an initial 50 MW pilot solar auction (under NEPRA framework) at a site near Manjhand, district Jamshoro. Component-2 is Distributed Solar which includes at least 20 MW of distributed solar PV on the rooftops and other available space on and around public sector buildings (schools, hospitals, administrative buildings) in Karachi, Hyderabad, and in other districts of Sindh. Component-3 is Solar Home Systems to at least 200,000 households in Sindh-targeting areas with low or no electricity access in Sindh. Component-4 is Capacity Building & Technical Assistance activities to support the design implementation of the program and to learn state of the art solar PV technologies in practice in developed countries for electricity access. Moreover, this component supports to Energy Department, Government of Sindh and other relevant entities.

3. AC (Power) briefed the participants about the project and pointed out that the proposed PC-1 is not according to the Planning Commissions format, Scope and cost estimations need to be elaborated. Furthermore, Results Based Monitoring (RBM), local and foreign components should be included in PC-1. Sponsor replied that PC-1 according to the format of Planning commission will be submitted soon.

4. Member (Energy) asked about the feasibility study of the project and status of stakeholder's consultation. Sponsors replied that feasibility study is already being conducted by World Bank and three volumes of feasibility study for component-1 have been provided to the forum. They further informed that according to World Bank survey, buildings in Karachi have huge potential for solar roof tops, whereas local management has not been approached yet. Seven villages are already solarized in Tharparkar on pilot basis, however 300 more villages will be provided with electricity through component- 3. The sponsors are

requested to provide complete copy of feasibility studies including power evacuation plan on urgent basis for further processing the case for consideration of CDWP.

5. For component 2 of the project, Member (Energy) inquired about the list of buildings and their connected load which will be switched to solar power, and whether the Karachi Metropolitan Corporation has been taken on board or otherwise. He further pointed out that detailed system design and plan layout is missing in the PC-I. He directed that list of villages which are off-grid may be provided along with lesson learnt from previous projects.

6. Representative from HESCO informed that 132kV HESCO's transmission system is part of the integrated transmission network, comprising 500/220kV system of NTDC. In case of any injection of Power at any voltage level will impact the NTDC's system & the impact of this project will be on both transmission system networks / integrated transmission networks (NTDC's + HESCO's). Besides, NTDC being the main stake holder of integrated transmission network has not been taken on board regarding safe dispersal of such huge electric power (i.e. 400 MW) from the said Project. It is pertinent to mention that existing HESCO's 132kV system in the vicinity of proposed solar project is not in a capacity to evacuate proposed 400 MW.

7. Representative from AEDB informed that component-1 needs to be in line with the policies and plans of the federal government. This project is not included in the solar P. power plans as approved by the Cabinet Committee on Energy (CCOE) and in instead of going for loan, involvement of private sector may be considered. For component- 2, loan for solarization of public building is not be supported, whereas, phase wise conversion on own funding basis will be supported. Moreover, keeping in view market developments and innovative solar PV business concepts evolving in the private sector, piloting installations may not be required. Private sector companies would be willing to offer installations at public sector buildings if adequate investment protection and lucrative incentives are offered to them. For component- 3, grant option may be considered.

8. The sponsors informed that Component-1 is designed to put competitive bidding into practice through a pilot solar auction on the 50 MW site, resulting in a new benchmark on both process and pricing and attracting private sector investment, including foreign direct investment (FDI). For component-2, there is substantial expenditure of GoS against electricity bill payments to DISCOs. This component will help to reduce monthly payments made against electricity bills. For component -3, no grant option is available right now however if in future any grant opportunity is provided, will be availed.

9. Representative from EAD informed that World Bank is very interested in providing loan for this project but loan should be in line with national policy and national interest. Further all stakeholders must be on board. Sponsors clarified that loan for the subject project is for Govt. of Sindh and Govt. of Sindh will repay the loan accordingly.

Decision

10. After detailed deliberations, the following decisions were taken:
 - iv. Detailed Feasibility Study of the project including all components should be provided. Project will not be submitted to CDWP without furnishing a detailed feasibility study and an updated PC-I based on the feasibility.
 - v. The sponsors may also provide replies of observations raised in the working paper and during the meeting.
 - vi. Next meeting will be held once the compliance of the decision of Pre-CDWP meeting is received from the sponsors. Moreover, all the relevant stakeholders including NTDCL, AEDB, Power Division and HESCO will be invited in the next meeting to discuss the possibility of evacuation of power from component -1 (400 MW) of the proposed project.

**PARA WISE REPLIES ON THE OBSERVATIONS RAISED IN WORKING PAPER OF
PRE-CDWP MEETING**


**REPLIES TO OBSERVATIONS RAISED ON SINDH SOLAR ENERGY PROJECT
(SSEP) FOR PRE-CDWP MEETING HELD ON 17TH APRIL, 2018**

iftekhar ahmed

Wed 4/25/2018, 3:20 PM

To: fayub1212@gmail.com <fayub1212@gmail.com>

Cc: Mehfooz Qazi <mehfoozkazi@yahoo.com>

 1 attachments (60 KB)

Reply on Pre-CDWP observations 2542018.docx;

Dear Fozia,

I am directed to refer the Pre-CDWP meeting held on 17th April, 2018 for the subject project.

2. Please find attached herewith the para wise replies on the observations raised in the working paper for necessary action please.

Regards,

Iftekhar Ahmed,

Deputy Director (Off-Grid Solar)

Energy Department,

Government of Sindh

02199207144

03332452668

Sent from Mail for Windows 10



DAE/Solar/105/2016
GOVERNMENT OF SINDH
ENERGY DEPARTMENT

Karachi, dated 25th April, 2018

Ph: 02199206448

**PARAWISE REPLY ON OBSERVATIONS RAISED BY MINISTRY OF PLANNING,
DEVELOPMENT AND REFORM, GOVERNMENT OF PAKISTAN FOR PRE-CDWP MEETING**

S/NO.	COMMENTS	REPLY											
1.	It is observed that the proposed PC-I of the project is not according to the format of Planning Commission. It is simply based on the Project Appraisal Document prepared by World Bank. The sponsors are requested to prepare PC-Is with due diligence in future and provide the clear scope of work and capital cost estimates (in terms of FEC & LCC).	<p>As advised during the Pre CDWP meeting, the following four sections has been resubmitted in line with Planning Commission Format</p> <ul style="list-style-type: none">a. Locationb. Scopec. Capital Cost estimatesd. Result Based Monitoring. <p>Location: The project will cover all districts of the province.</p> <p>Scope of the project is to:</p> <ul style="list-style-type: none">a) Develop basic infrastructure at solar parks for at least 400 MW. The power generation projects will be established by IPP. IPPs will be assigned a project within solar park through competitive bidding as per NEPRA Regulations. Initially 50 Solar PV based power generation MW project at Manjhand near Khanot Grid Station, Taluka Manjhand, District Jamshoro will be auctioned out using NEPRA Regulation with the technical support of the World Bank Group. The World Bank Group has already experience of Competitive bidding in various part of the World. Recent examples was in Argentina, India and Zambia with record reduction in solar tariff. Bidding process illustration is enclosed as Annexure A.b) 20 MW of distributed solar PV on the rooftops and other available space on and around public-sector buildings in Karachi and Hyderabadc) 200,000 households will be provided access to electricity through standalone solar PV systems <p>Capital Cost estimates: Capital cost estimates in terms of FEC & LCC are as follows:</p> <table><tr><th rowspan="2">Item</th><th>Local</th><th>FEC</th><th>Total</th></tr><tr><th>Rs. In Million</th><th>Rs. In Million</th><th>Rs. In Million</th></tr><tr><td> </td><td> </td><td> </td><td> </td></tr></table>	Item	Local	FEC	Total	Rs. In Million	Rs. In Million	Rs. In Million				
Item	Local	FEC		Total									
	Rs. In Million	Rs. In Million	Rs. In Million										

Salaries of PMU Staff	132.33	0.00	132.33
Purchase of Office Equipment	17.55	0.00	17.55
Purchase of Vehicles	22.65	0.00	22.65
Operating Expenses	136.72	0.00	136.72
Contingencies	15.46	0.00	15.46
Third party monitoring (1%)	115.50	0.00	115.50
Utility-Scale Solar	2640.00	1760.00	4400.00
Distributed Solar	825.00	1925.0	2750.00
Solar Home Systems	990.0	2310.0	3300.00
Technical Assistance & Capacity Building	0.00	550.00	550.00
Total	4895.21	6545.00	11440.21

2.	<p>ii) The cost of the project is approx. Rs. 11.4 billion which should be based on feasibility study. The sponsors are requested to provide copy of feasibility study of the project duly validated by the third party.</p>	<p>The project is proposed on Feasibility Studies carried out for solar dissemination. The copies of the following studies are enclosed:</p> <ol style="list-style-type: none"> 50 MW Solar excluding Grid interconnection study, which will be carried out in collaboration with HESCO. Sindh Energy Department is proposing a framework approach for this Project, considering its large size in terms of financing, and the five-year implementation period. This is very standard for other projects financed by multilateral development banks. Demand for Distributed Renewable Energy Generation in Pakistan carried out in June, 16 by the World Bank Group Internal Feasibility for Solar Home Systems by Energy Department
3.	<p>It is mentioned in the PC-I at page 2 that estimated cost of the project is US\$105 million, of which the World Bank share is \$100 million, and Government of Sindh share is \$5 million. The sponsors are requested to provide firm commitment of funds.</p>	<p>Commitment letter and AIDE MEMOIRE regarding lending support of World Bank for the project are enclosed. The proposal of loan approval is in process at WB Board and expected by end of July.</p> <p>Negotiations on IDA credit is underway through Economic Affairs Division (Copy of letter is enclosed)</p>
4.	<p>The sponsors may furnish detailed specifications, quality, type of solar panels, its efficiency, life and how it is suited / matched with the local ambient temperature and cooling thereof. The sponsors may give</p>	<p>The Tier 1 equipment as per IEC standards duly recommended by the Alternative Energy Development Board will strictly be followed for maintaining the quality, efficiency and life of systems, and operation under moderate and extreme temperatures as per local climate. Further AEDB certification regulations 2017 will also be followed during execution of the project.</p>

	detailed/comprehensive technical parameters so that this project may operate successfully on sustainable basis.																												
5.	The sponsors have not clarified that how much GWh will be saved through implementation of the proposed project.	<table><tr><th>Capacity</th><th>Tilted Irradiation</th><th>Annual Production</th><th>Production Total 25 Years</th></tr><tr><td>20 MW (distributed)</td><td>2,000 kWh/kWp</td><td>32 GWh</td><td>750 GWh</td></tr><tr><td>50 MW (pilot utility-scale)</td><td>2,250 kWh/kWp</td><td>90 GWh</td><td>2,109 GWh</td></tr><tr><td>400 MW (total utility-scale)</td><td>2,250 kWh/kWp</td><td>716 GWh</td><td>16,875 GWh</td></tr><tr><td>420 MW (total installed under Components 1 and 2)</td><td>(see above)</td><td>748 GWh</td><td>17,625 GWh</td></tr><tr><td>200000 SHS each of 100 W</td><td>2,250 kWh/kWp</td><td>43 GWh</td><td>1075 GWh</td></tr></table>	Capacity	Tilted Irradiation	Annual Production	Production Total 25 Years	20 MW (distributed)	2,000 kWh/kWp	32 GWh	750 GWh	50 MW (pilot utility-scale)	2,250 kWh/kWp	90 GWh	2,109 GWh	400 MW (total utility-scale)	2,250 kWh/kWp	716 GWh	16,875 GWh	420 MW (total installed under Components 1 and 2)	(see above)	748 GWh	17,625 GWh	200000 SHS each of 100 W	2,250 kWh/kWp	43 GWh	1075 GWh			
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6.	The sponsors have allocated an amount of Rs.136.718 million for operating expenses including POL, stationary, rent etc. The sponsors may provide basis of cost estimates along with justification.	The Scope of the project is spread over the entire Sindh province including remote areas and urban cities. Cost estimates are based on previous project experience. This includes project staff salaries which are proposed to be based on Standard Pay Package notified by Finance Department, Government of Sindh vide No. FD (SR-III)5-29/2008(A) dated 21 st September, 2017. Other costs include purchase of Office Equipment which is mandatory for establishment of dedicated office for the project, operating expenses of the office and purchase of few mandatory field vehicles for smooth execution of the field activities/surveys/field visits. The POL, stationary, expenses will be as per standard rates notified by Finance Department from time to time.																											
7.	Capital cost estimates may be provided in detail with clear identification of Local and Foreign Exchange components. Moreover, detailed workout of each component may also be provided.	Capital cost estimates with clear Local and Foreign are detailed as follows: <table><tr><th rowspan="2">Item</th><th>Local</th><th>FEC</th><th>Total</th></tr><tr><th>Rs. In Million</th><th>Rs. In Million</th><th>Rs. In Million</th></tr><tr><td>Salaries of PMU Staff</td><td>132.33</td><td>0.00</td><td>132.33</td></tr><tr><td>Purchase of Office Equipment</td><td>17.55</td><td>0.00</td><td>17.55</td></tr><tr><td>Purchase of Vehicles</td><td>22.65</td><td>0.00</td><td>22.65</td></tr><tr><td>Operating Expenses</td><td>136.72</td><td>0.00</td><td>136.72</td></tr></table>				Item	Local	FEC	Total	Rs. In Million	Rs. In Million	Rs. In Million	Salaries of PMU Staff	132.33	0.00	132.33	Purchase of Office Equipment	17.55	0.00	17.55	Purchase of Vehicles	22.65	0.00	22.65	Operating Expenses	136.72	0.00	136.72	
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Solar Home Systems	990.0	2310.0	3300.00
Technical Assistance & Capacity Building	0.00	550.00	550.00
Total	4895.21	6545.00	11440.21

Detailed workout of each component is enclosed at Annexure G.

- | | | |
|-----|--|--|
| 8. | <p>The sponsors have not mentioned in the project document that EIA study for the project has been carried out or not? The sponsors may provide the status of EIA study. Further, the sponsors are expected to clear the EIA report from relevant EPA, followed by its NOC.</p> | <p>The EIA study report in compliance with the WB regulations and SEPA requirement has been prepared and is in approval process with SEPA. The project will be executed after obtaining approval/No Objection Certificate from SEPA. Since the scope of the project is related to solar dissemination to mitigate the climate change hazards therefore no major environmental issues are expected.</p> |
| 9. | <p>An amount of Rs.22.65 million has been allocated for purchase of 4 vehicles and 2 motorcycles. Moreover, Rs.1.5 million has been allocated for Insurance of 6 vehicles. The sponsors are requested to justify the amount of insurance for 6 vehicles as there are only 4 vehicles and also number of vehicles.</p> | <p>4 field vehicles are proposed for smooth execution of filed activities/surveys/field visits involved in the project in remote areas of thar desert in the east side and kerthar mountain ranges in the west side near border of Sindh with Balochistan. The project sites comprise of mostly off-road areas where travelling through ordinary vehicle is not an option. In Sindh, it is made mandatory by the Government to get the assets insured by the Sindh Insurance Company Ltd., Hence, an amount of Rs. 1.5 million is proposed for insurance of 4 vehicles and 2 motorbikes.</p> |
| 10. | <p>An amount of Rs 4.40 million has been allocated for Utility Store Solar component in which 50 MW project will be developed at Manjhand. However, no details of 50 MW power project regarding its evacuation plan, grid station (132 kV or 220 kV), interconnection with concerned DISCO and land for the project are not given in the PC-I. The sponsors are requested to</p> | <p>Basic infrastructure at solar parks will be developed through this project for at least 400 MW. The power generation projects will be established by IPP. IPPs will be assigned a project within solar park through competitive bidding as per NEPRA Regulations. The map of 1st 50 MW solar project site alongwith coordinates is enclosed. The power evacuation plan and Grid Station interconnections with HESCO will be finalized with HESCO authorities based on the Grid data assumptions.</p> |

	provide the details and justify the same.	
11.	An amount of Rs.2.75 million has been allocated for Distributed solar component and Rs.3.30 million for Solar Home Systems without any details and justification. The sponsors are requested to provide the same.	The feasibility study titled "Demand for Distributed Renewable Energy Generation in Pakistan" has been carried out in June, 16 by the World Bank Group. The study suggests the potential of 84 MW solar potential in major hospitals and public buildings having an available space of 1057300 sq. meters. (Copy enclosed).
12.	An amount of Rs.550.00 million has been allocated for Technical Assistance and capacity Building component that includes training of Sindh Energy Department, consultancy services etc. It may be brought out that these will be hired from the market or deputed on the project by internal adjustment. Moreover, the sponsors may provide the justification of this amount and training details for the project.	A substantial proportion of Component 4 will be obtained from the market, for the development of mini micro and smart grid based on renewable energy resources available. There is no any smart grid operating in Pakistan and the services will be hired from market based on international practices. The component will also include foreign trainings of project staff on need bases. The amount selected is based on other similar WB-financed projects and can be adjusted during implementation if it is found to be in excess of need.
13.	In addition to above the sponsors may provide the following information; a. Lessons Learnt and Incorporated in Design of the Project:	<p>The projects developed by IPPs are based on unsolicited sites without any competitive bidding. The regulator announced the competitive bidding in January, 2017 but the enabling environment has not been created since last one and a half year. Whereas in international practices of competitive bidding drastically reduced the solar tariff.</p> <p>The Project builds on an increasing body of evidence for how to best facilitate private sector investment and ensure sustainability, drawing on lessons learned in Pakistan and internationally. These include the following:</p> <ul style="list-style-type: none"> • Facilitating private sector involvement. Strategically utilizing public funding to leverage private sector investment and expertise is central to this Project. This lies at the heart of the concept of Solar Parks and shared infrastructure, where a relatively small amount of public investment can help to de-risk project development, resulting in low tariffs under solar power auctions. This has already been demonstrated in WBG-financed projects in Argentina, India and Zambia. For off-grid electricity access, private sector involvement helps minimize up-front public financing requirements, helps ensure that households get the services they desire, and leads to better long-term outcomes.

- **Sustainability of O&M.** There is concern among policymakers in Pakistan in ensuring that interventions are commercially and technically sustainable over the long-term. The experience with distributed and off-grid solar generation so far is poor, with public sector installations often having with no O&M plan in place, leading to rapid deterioration of performance and eventually failure. Ensuring long-term O&M is central to this Project and is reflected in each of the components: in Component 1 through the annual fee paid to SED for developing and maintaining the Solar Park assets, and through private sector ownership of the solar power plants; in Component 2 by putting in place a performance-based O&M contract, and establishing a revenue-generating model to cover long-term O&M; and in Component 3 through private sector delivery and the alignment of incentive structures to ensure a long-term presence in target communities.

b. Requirement of Vehicles:

Sr No	Make and Model of vehicles	existing owned by the Executing Agency	Requirement under the project	Justifications for additional requirement
1	Toyota Hilux Vigo MT	1 No. as pool vehicle and is dedicated to other wind and solar power projects being executed under IPP and Annual Development Program	Toyota Fortuner 1 No., Toyota Hilux Revo 3 Nos.	4 field vehicles are proposed for smooth execution of field activities/surveys/field visits involved in the project in remote areas of Thar desert in the east side and Kirthar mountain ranges in the west side near border of Sindh with Balochistan. The project sites comprise of mostly off-road areas where travelling through ordinary vehicle is not an option.

c. Existing Facilities:

Sr No	Facility/ Input/ Services	Existing with Executing Agency	Proposed under the project	Justification for additional requirement
1	Office Accommodation,	Office accommodation is available for housing existing staff of the Directorate of Alternative Energy,	Office Accommodation,	Existing Office Accommodation is insufficient for housing the project staff as well as the regular staff of DAE.

		necessary office equipment		
2.	Copier (1 No)	In use of DAE	Copier heavy duty all in one (2 Nos)	Dedicated copiers will be needed for the project. These copiers will also serve as central printers connected with LAN.
3.	Computers with Printers (4 Nos)		Personal Computers with LCD Display and Printer Laser (3 Nos)	Needed for supporting staff accounts and admin assistants.
4.	Fax Machine (1 No)			
5.			Laptop (11 Nos)	Dedicated Laptops will be needed for executive officers working on the project.
6.			LAN (Server, Switches, Wiring, wifi routers etc)	For creating internal internet network within the project office
			PABX, Phone Sets, wiring and accessories	For creating telephone network within the project office
			CISCO Communication System	For online communication with World Bank team housed outside Pakistan
			Smartphones	For on site progress reporting at ADP Progress Dashboard
			Solar System with Battery Backup 10KVA	As standby power system for office Accommodation

d. Ownership of project assets after completion:

Sr No	Assets Description	Ownership to be transferred to	Justification
1.	Copier heavy duty all in one (2 Nos)	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.
2.	Personal Computers with LCD Display and Printer Laser (3 Nos)	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.

3.	Laptop (11 Nos)	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.
4.	LAN (Server, Switches, Wiring, wifi routers etc)	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.
5.	PABX, Phone Sets, wiring and accessories	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.
6.	CISCO Communication System	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.
7.	Smartphones	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.
8.	Solar System with Battery Backup 10KVA	Executing Agency i.e. Directorate of Alternative Energy	Life of project is 25 years and regular monitoring will be needed after completion of the project.

e. Risks and mitigation measures.

The Overall Risk associated with the Project is assessed as moderate. The various risks related to the Project were assessed through the Systematic Operations Risk-Rating Tool (SORT) as per table below. Risks rated as substantial and pertinent mitigation actions are described below.

Summary of risk rating:

Risk Categories	Rating
1. Political and governance	Moderate
2. Macroeconomic	Moderate
3. Sector strategies and policies	Moderate
4. Technical design of the project	Moderate
5. Institutional capacity for implementation and sustainability	Moderate
6. Fiduciary	Substantial
7. Environmental and social	Moderate
8. Stakeholders	Moderate
9. Others	Not applicable
Overall	Moderate

Mitigation Measures. For the three Components, mitigation measures will include tree plantation, evaluation of structural integrity of the PCRs, mandatory compliance with environmental code of practices (covering waste, fuels and hazardous goods, water, drainage, soil, erosion, soil management, etc.), strict adherence to working timings, and preparation of site specific waste and

traffic management plans. Noise quality will be maintained with the permissible limits by using noise abatement devices and barriers, and high noise activities would be restricted to normal working hours only. It will be ensured that waste from construction activities is not released into any surface or groundwater source. Special care will be taken to keep fuels, lubricants and chemical in specially designated areas to avoid soil contamination. The World Bank Group's EHS guidelines will be implemented. Land may be required on a temporary or small-scale basis and to facilitate this an RPF has been prepared. RAPs will be prepared to ensure that people are compensated where required. Screening will also be undertaken for impacts on old buildings. Labor issues will be stringently monitored by the Project and contracts will include specific clauses for compliance with Pakistan's labor laws. In case the buildings selected for distributed solar power generation are protected under the Sindh Cultural Heritage Act of 1994, a Physical Cultural Resources (PCR) Management Plan will be prepared for such subprojects in accordance with OP 4.11 and the Sindh Cultural Heritage Act of 1994.

f. Implementation arrangement (implemented through ICB or EPC etc.)

The project will be implemented through a dedicated Project Management Unit. Under each component International Competitive Bidding (ICB) procedures will be followed under prevailing bidding rules/regulations/procedures.

g. The RBM indicator provided by the sponsors is lacking in many aspects. The sponsors may provide the RBM indicator for the project worked out on the basis of energy generated in kwh and financial returns in million rupees.

Input	Output	Outcome		Targeted Impact
		Baseline Indicator	Targets after completion of project	
The project accounts a total budget of Rs. 11440.21 Million i.e. Rs. 440.21 Million as Local and Rs. 11000.0 Million as FEC	748 GWh/Anum generation of grid connected electricity and 43 GWh/Anum generation of stand alone based electricity	i. 27% of the population do not have access to electricity (Report on National Action Plan Sustainable Energy for All, January 2018 by UNDP and Ministry of Planning Development & Reform, Govt. of Pakistan) ii. Reduction of average cost of generation, diversify away from imported fossil fuels, and realize the	200000 households will be benefited with solar home systems and will receive cheap, sustainable source of electricity. 420 MW will be connected with the Grid this will generate 17625 GWh over 25 years.	i. Provision of electricity to 200000 households in rural areas will improve socio-economic activities within the community and improve the living standards. ii. Improve the literacy rate in rural areas. iii. and will save cost of grid construction in those rural villages. iv. Access to Green energy will mitigate the

		climate change, air pollution, and water conservation benefits of transitioning to renewable sources of electricity		climate change effects. v. vi. Will establish 1 st Solar Auction practice in Pakistan, to reduce the basket price of electricity.
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**FEASIBILITY STUDIES OF COMPONENT 1, COMPONENT 2 AND COMPONENT 3
OF SINDH SOLAR ENERGY PROJECT**

- 1. Executive Summary of Feasibility Report of 50 MW Utility-Scale Solar Project [Component 1] & Soft Copies of Feasibility Study Reports are enclosed as CD**
- 2. Feasibility of Distributed Solar in Sindh [Component 2]**
- 3. Feasibility of Solar Home Systems in Sindh [Component 3]**


Feasibility Studies Sindh Solar Energy Program

iftekhar ahmed

Tue 5/22/2018, 10:53 AM

To: fayub1212@gmail.com <fayub1212@gmail.com>

Cc: Mehfooz Qazi <mehfoozkazi@yahoo.com>

 4 attachments (5 MB)

FS-Annex_SSEP_Component-1-Cover_21May2018.pdf; FS-Annex_SSEP_Component-2_21May2018.pdf; FS-Annex_SSEP_Component-3_21May2018.pdf; FS-Main_SSEP_21May2018.pdf;

Dear Fozia,

Assalam o Alaikum,

I am directed to submit the attached Feasibilities of Sindh Solar Energy Project for your kind consideration please.

Regards,

Iftekhar Ahmed,
Deputy Director,
Energy Department,
Government of Sindh
021 99207144
03332452668

Sent from Mail for Windows 10

Sindh Solar Energy Project:

ANNEX 1 – Feasibility of 50 MW Utility-Scale Solar Project [Component 1]

May 2018



**Feasibility Study Report – Vol. 1
Main Report – Part 1
50 MW Solar PV Power Project at Taluka
Manjhand, Jamshoro**

Document No. 170-0786-01
Rev No. / Date 170-0786-01
Issue No. / Date 4th July 2017
Effective Date 10th September 2017
Page No. 21 of 124
Originally Prepared by Well Connect (Pvt) Ltd

EXECUTIVE SUMMARY OF THE PROJECT

The objective of this study is to assess the feasibility of developing a 50 MWp ground-mounted solar PV facility (Project) at a suitable location within the designated solar park at Taluka Manjhand, Jamshoro, Sindh.

The analysis of prevailing and collected data reveal that the conditions on ground including but not limited to solar resource (irradiation), road access, security, proximity to grid with capacity for evacuation of power, geological surroundings and environment are suitable for development of such a MW scale solar PV power project. Whereas the numerous site visits, topographic survey and geo-technical investigations conducted further confirm the hypothesis.

The project is located at 25°46'18.65"N 68°15'10.96"E encompassing an area of approximately two hundred fifty (250) Acres within the designated Solar Park at Taluka Manjhand, Jamshoro Sindh. It is one of 50MW projects in the Park cumulatively adding up to 1 GW. The Solar Park is the first of its kind initiated by the Sindh Government.

After having duly modelled and conducted simulations of all available modules and technologies, for fixed tilt, single axis and dual axis rotation mounting systems respectively, the thin film (CdTe) panel technology has been selected for the base case with fixed tilt mounting structures, in view of its optimum comparative performance.

System simulations for yield analysis of the selected technologies for the base case show that the power project generates up to 108317 MWh/year of electricity over the project life cycle of twenty five (25) years. The P(90), P(75) and P(50) figures are 103426, 105755 and 108317 MWh/year respectively. To allow for uncertainty in the solar resource (irradiation), equipment performance and power generation modelling the P(50) yield output numbers have been used for the base case.

The financial calculations of the base case result in a tariff for the generated electricity supplied to the national grid for the first ten (10) years as 6.5121 PKR/kWh, (6.2020 US\$) whereas 2.7670 PKR/kWh (2.6352 US\$/kWh) for the remaining fifteen (15) years. The project financing structure is assumed to be on a seventy-five twenty-five debt equity ratio (75:25) with the total project cost being \$40,701,984. The financial analysis is based on an IRR of seventeen percent (17%) resulting in a payback period of 10 years.

The most significant factors in preparation of the financial model are the debt financing conditions, resource potential, equipment performance, yield assessment and the corresponding tariff. To account for uncertainties in these parameters though yield values at P(50) were taken for comparison of various technologies, post equipment/technology selection an uncertainty analysis was conducted computing



Feasibility Study Report – Vol. 1
Main Report – Part 1
50 MW Solar PV Power Project at Taluka
Manjhana, Jamshoro

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P(50), P(75) and P(90) values, while P(75) yield value was selected given the long term irradiation uncertainties and possible annual fluctuations.

Taking into the different mounting possibilities the fixed installation shall be implemented as it has the least capital and operational risks. The tracking devices require more maintenance due to their moving parts, whereas the additional yield does not offset the associated incremental costs. It is recommended to develop small areas of MW scale parks with tracking systems, so that experience with this technology can be gathered and used to decide if tracking systems should be considered in future PV park developments in Pakistan.

The project time plan is aggressive. The main risks for the time plan are delays for necessary approvals in the design phase and the delivery time for the equipment including the high voltage Substation. The construction of the solar field itself is not critical as the site is ideal for installation and can be ready with minimal land works.

The designated Solar Park will be very beneficial to the people of Sindh, Pakistan receiving more power from one of the most economical sources of power generation today.

Detailed Feasibility Study report of 50 MW Solar Power Project
is enclosed as CD.

Sindh Solar Energy Project:
ANNEX 2 – Feasibility of Distributed Solar
in Sindh [Component 2]

May 2018

Feasibility Study of Distributed Solar for Public Buildings in Sindh

A. PROJECT TITLE

Sindh Solar Energy Project: Component 2 - Distributed Solar for Public Buildings in Sindh

B. INTRODUCTION

Pakistan has significant renewable energy (RE) potential, including solar, mainly as a result of its geographic location. Taking advantage of this potential will decrease the country's dependence on imported fossil fuels as well as reduce greenhouse gas emissions. Recognizing this, the government has encouraged private sector independent power producers (IPPs) to enter the market, with 430 MW of utility-scale solar capacity installed so far. However, the country has much greater potential to absorb solar and other forms of renewable energy, and with the cost reductions over the last few years solar is poised to become a least-cost form of electricity generation in Pakistan.

Solar development in Pakistan to date has been primarily limited to larger, ground-based projects, undertaken within the confines of the Quaid e Azam Solar Park in Bahawalpur, Punjab Province. In countries with more developed solar markets, such as Germany, Japan, and the United States, a significant portion of solar capacity is produced by rooftop and distributed solar photovoltaic applications with 1 kW to 10 MW capacities. Given the fast pace of urbanization and corresponding residential, commercial and industrial markets, there is a significant potential for distributed solar deployment in Pakistan.

Under Component 2 of the Sindh Solar Energy Project (SSEP, or the Project), World Bank financing is proposed to initiate a distributed solar program in Sindh Province focusing on public sector buildings, with a target of 20 MW installed capacity over five years. The target is deliberately set low in comparison to the likely available potential to allow for lesson learning, but may be scaled up in future years if the program is successful and pending additional financing.

This initial feasibility study, carried out as part of the Project approval process, is intended to provide high-level responses to a number of critical issues.

C. Distributed Solar in Pakistan

Pakistan has very substantial solar resource potential, in particular in the south and west of the country where the average resource is over 4.5 kWh/kWp/day. Figure 1 illustrates the levels of solar radiation across Pakistan. The resource maps, validated with data from nine ground-based measurement stations, were published in March 2017 under a World Bank technical assistance project under a global initiative of the Energy Sector Management Assistance Program ("ESMAP").

For the promotion of distributed solar in Pakistan, regulation was introduced in September 2015 to incentivize distributed solar. The policy mandates all distribution companies to connect distributed generation to the grid and lays out certain provisions for the installation and execution of distributed systems. Despite the immense potential illustrated by Figure 1, by the end of 2017, around 8 MW of licensed distributed solar had been installed in Pakistan.

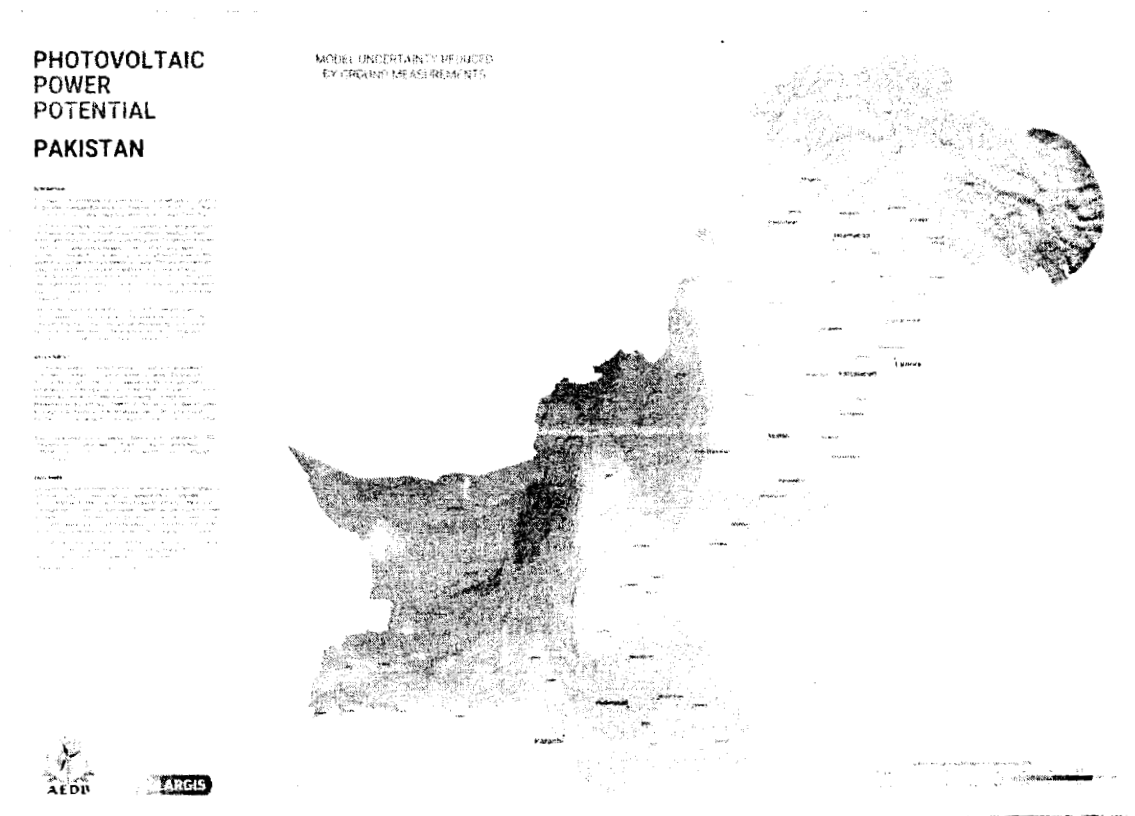


Figure 1: Solar Resource Map of Pakistan (Source: AEDB)

D. Current Global Market

PV prices continued to fall in 2017. The average cost of mainstream crystalline silicon modules in Europe fell by 14% over the course of the year, industry analysts expect modules will drop by a further 15% in 2018, when more upstream manufacturing capacity comes on line.

The impact of steadily declining costs, coupled with the recent rebound in dollar investment, has been positive. Global installed residential and commercial PV capacity grew by 28GW to 173GW in 2017, slightly up on the 22GW added the previous year, according to preliminary data from Bloomberg New Energy Finance. Cumulative capacity is now double what it was in 2013 and more than five times the 31GW in existence at the start of the decade.

Growth.

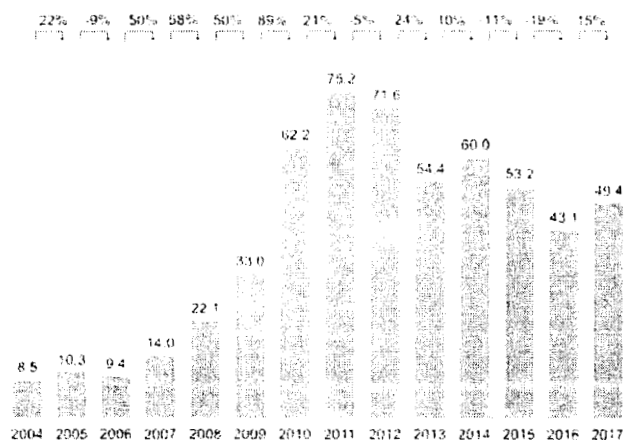


Figure 2: Small Distributed Capacity Investment, 2004-2017, \$BN

Japan was estimated to have 36GW of installed residential and commercial PV capacity by the end of 2017, the most of any country worldwide. Germany was next with 30GW, then came the U.S. on 18GW, followed by China and Italy with 17GW and 15GW, respectively. Australia trailed the major nations with 6GW. The rapid build-out in these countries, together with more moderate growth in France, Belgium and India, has been driven chiefly by government policy, mainly in the form of financial subsidies.

		Growth
China	19.6	396%
United States	8.9	-12%
Japan	5.4	-38%
Australia	1.5	18%
Germany	1.4	4%
India	1.1	0%
Korea (Republic)	0.7	-15%
Netherlands	0.6	-17%
Pakistan	0.5	-10%
France	0.5	40%

Figure 3: SMALL DISTRIBUTED CAPACITY INVESTMENT BY COUNTRY, 2017, AND GROWTH ON 2016, \$BN

Each of the top six countries listed in Figure 3, with the exception of China, has achieved commercial PV 'socket parity' (where commercial rooftop solar electricity is cheaper than electricity from the grid), and two (Australia and Germany) have attained 'residential' PV socket parity. Such low costs mean markets are better able to withstand subsidy cuts. In Australia, for example, when installers were faced with reduced support, they were able to lower their prices to maintain sales.

Investment in small-scale solar projects of less than 1MW capacity increased by \$6.3 billion in 2017. An estimated \$49.4 billion was spent building about 28GW of such power plants. This dollar value was up 15% on the \$43.1 billion invested the year before. Nevertheless, this was a considerably smaller amount than in years prior to that – between 2010 and 2015, the average invested in small-scale renewables was \$63 billion a year, with a peak of \$75.2 billion in 2011 (as illustrated in Figure 2).

Any comparison of investment over time needs to take account of falling PV costs – \$1 invested in 2017 bought considerably more solar PV generating capacity than it did at the start of the decade. In 2010, the average cost per Watt of a residential PV system in Germany was \$3.90, but by the end of 2017 it had fallen 57% to \$1.68. In Australia, the decline was even more pronounced. A 4kW PV system cost an average of \$6.40 per Watt in 2010, yet by the end of 2017 it had plummeted 78% to just \$1.40 per Watt.

E. Lessons from International Experience

Distributed solar can play an important role in achieving significant level of solar generation. In countries with developed solar markets, distributed generation has made a significant contribution to the total installed capacities. Examples include Germany, USA, Japan and the emerging economies of China and India. As the distributed generation sector in Pakistan is still developing, a number of valuable lessons can be learned from established solar markets. In the following section, some of the more critical lessons from these countries have been identified.

California - United States

The United States has one of the most developed solar markets and has experienced a significant growth in overall installed solar capacity, with an increase from 1.2 GW in 2008 to an estimated 40 GW in 2016. The United States has a comprehensive policy landscape regarding distributed solar. The making and implementing of energy policy in the US takes place at several levels: federal, state and local, with a large number of policies being drafted and executed at the local (municipal and state) level. (This is in contrast to Germany and China where policies were drafted and executed on a national level.)

As early as 1979, California introduced net metering (NM) to encourage solar deployment. NM is designed to compensate for excess power generated from solar sources at the retail price of electricity (generally around 17 to 20 US cents/kWh). NM and subsequent financial compensation has been highly successful in the United States. The most popular business model used to execute compensation is the third-party model. In California, this includes all parties who avail of the state's Power Purchase Agreement (PPA) through a Renewable Energy Service Company (RESCO). Throughout the country, NM and subsequent compensation is promoted and encouraged through financial benefits in the form of tax rebates and soft loans and several incentive schemes.

India

The government of India has set an ambitious target of 175 GW of electricity to be added by RE by 2022. Of the total 175 GW, 100 GW have been assigned to solar power of which 40 GW is to be added by decentralized and distributed solar projects. According to a study conducted by The Energy and Resources Institute (TERI) in 2014, the market potential of distributed solar in India was estimated at 124 GW. In 2016, the cumulative installed PV capacity stood at 12.3 GW, with grid connected rooftop capacity at roughly 1 GW.

Similar to the United States, India has a comprehensive and complicated policy landscape. It was a late entrant in the solar market and, as such, its policies are based on the experiences of developed countries. Both central and state level policies are in place for solar and distributed solar. Most of the Indian utilities have made provisions for distributed solar including single window clearance procedures. Technical standards for various solar systems are also well defined. Most of the states have provided options for NM with exception of only few states allowing for a FiT scheme.

The most popular model for distributed solar in India is the self-consumption model - in this model, the owner consumes the electricity produced by the distributed solar system and sells any excess power to the grid. The Ministry of New and Renewable Energy provides incentives in the form of Central Financial Assistance. For the residential consumer category, this entails a 30% capital subsidy on the benchmark cost of distributed solar in all states except special category states¹⁰ where there is a 60% capital subsidy on the benchmark cost.

Germany

Germany has one of the world's largest solar PV markets, with 42 GW of installed capacity and an annual growth of 2.4 to 2.6 GW in the installed capacity until the target of 52 GW is achieved¹¹. Nearly 65% of Germany's solar PV capacity comes from distributed solar. Germany's rooftop solar development is primarily led by the national RES Act and its amendments (also known as the EEG Act). The RES Act highlights the key market driving policies, which include legislation on FiT, Feed-in-Premium (FiP) and market tendering. The country has set RE targets of 40%-45% by 2025 to 55%-60% by 2035. A final target is set for an increase to 80% by 2050 (150-200 GW).

A key to Germany's successful solar market is its pre-defined and streamlined permitting process for standardized solar systems. In addition, local permits and inspections are not required for residential distributed solar installations. There are also no permit fees for small residential distributed solar systems.

Germany promotes the "Self-Consumption" model for distributed solar to achieve greater growth in the national solar market. The government has also promoted a multi-owner/investor scheme in which many users own or invest in a single rooftop project, such as for multifamily apartment buildings (MABs).

China

China has the world's largest PV market, with almost 46% of the global solar PV capacity. As of 2016, it had an installed PV capacity of 77.4 GW. The rapid growth in China's solar sector has been the result of the government's declaration that any projects operational by June 30, 2016 would be eligible for a FiT rate of roughly 15 US cents/kWh. Projects completed after this date would receive a lower FiT rate. This led to a significantly high capacity addition in 2015. According to the National Energy Administration, the country aims to add over 110 GW in solar PV in the period of 2016-2020. The FiT incentives that led to the boom in the Chinese solar market were especially tailored to include distributed generation. Further enablers to the growth of the solar market included low cost materials and human resources, an increased electricity tariff and soft loans provided by state-owned Chinese banks.

Japan

Japan had an early lead in the solar PV technology market. In 1994, subsidies for solar systems were available for 50% of the system cost. These incentives were gradually reduced to 33% in 1999. As a result, over 250,000 residential PV systems were set up and increased the cumulative solar PV capacity from 43.3 MW (1994) to 1,422 MW (1999)¹³. The country has set a target of 64 GW of solar PV by 2030. In 2012, Japan introduced a FiT scheme. This led to an increase in solar PV installation and added significant PV capacity across all consumer segments. As a result, installed PV capacity in Japan increased from 3.81 GW in 2012 to 8.55 GW in 2013.

Up until mid-2014, a total of 10.5 GW of new PV capacity was installed. Cumulative rooftop capacity stood at 16.3 GW out of 23.3GW total solar PV installed in 2014.

Key Lessons Learned

Following are key lessons and features from these five countries which can help inform the policy and strategy for accelerating the installation of distributed solar in Pakistan:

Rooftop Solar Policy

- Set specific targets for distributed solar capacity, as in India and Japan.
- Set distributed solar size ranges and limits. India set limits for a solar PV system size to be in the range of 1 kW to 1 MW. A cap on the system size is also specified in the range of 80 to 100% of a facility's

connected load. A further minimum limit on self-consumption at the source is set around 80% of the energy produced from a distributed solar system.

Policies: Net Metering

- Promote Net Metering schemes, as was done in the United States and India.
- Consider additional incentives when justified, such as China, which offered an additional financial incentive (roughly 6 US cents/kWh) over the retail electricity tariff to encourage self-consumption.

Availability of Consumer Finance

- Improve access to financing. In developed markets, such as the United States, Japan and Germany, access to financing from commercial banks was important. In developing markets, access to low-cost financing, such as from state banks in China or through International Financial Institutions for India, for the distributed solar sector were needed.

Permits and Licensing

- Streamline licensing and permitting. Pre-defined and streamlined procedures, as was done in Germany and the United States is important. California introduced the Expedited Solar Permitting Act (solar bill AB 2188) in 2014 to streamline and encourage adoption of distributed solar, giving a deadline of one year for implementation to all 540 jurisdictions in California. This has led to an increase in distributed solar and a general growth of California's solar market.

Capacity Development

- Extensive capacity building program can help in achieving RSPV targets, such as in India. USAID's PACE-D program and the Indian Government's SETNET program aim to train over 400,000 skilled workers in the solar sector.

The Importance of Business Models

Business models are important in operationalizing investments in implementation of distributed solar. A brief description of different business models typically used globally is provided below:

Self-ownership model (Tariff Based)

For tariff based self-ownership business model, the roof owner is also the owner the distributed solar asset. The owner finances the asset with equity or receives a loan from a bank. The owner engages an EPC firm to install the distributed solar system and then enters into a PPA contract with the electric utility to sell the generated electricity at the tariff rate. The owner makes separate payments to the electric utility for the electricity consumed on site.

Self-ownership model (Net-metering)

This business model is similar to the self-ownership model under a tariff in that the facility or roof owner owns the distributed solar asset and transacts with the bank and distribution company. The key difference is that the power generated is not sold at the tariff, but rather deducted from the owner's utility bill. In other words, the owner pays the utility for the net electricity consumed (calculated as grid electricity consumed minus the solar electricity fed into the grid). If the solar generation exceeds the owner's grid consumption, the excess energy can be rolled over month to month. This business model is more commonly used in the residential sector in other countries.

RESCO or rooftop leasing Model (Tariff Based)

The RESCO is the owner of the distributed solar assets and, as such, finances the system and signs a PPA with the distribution company (Rooftop leasing model). The RESCO pays monthly rent for the rooftop use

to the building owner(s). This scheme allows building owners to create revenue from roof space without being associated with any bank or electric utility transactions. The 5 MW rooftop solar program in Gandhinagar, India is an example of the rooftop-leasing/RESCO model under a FIT scheme.

RESCO or rooftop leasing Model (Net-metering)

RESCO model can also be applied in conjunction with a net-metering scheme. In this case, the RESCO owns the distributed solar asset and transacts with banks, EPC firms and the utility. The building owner enters into a PPA with the RESCO and consumes the solar power generated by the distributed solar system. Any excess solar generation is netted with the electricity consumption from the grid. An example of this are the utility assisted businesses, offering a solution to high distributed solar adoption costs, which are prevalent in the United States.

F. Policies and Barriers to Distributed Solar Development in Pakistan

While the last few years have seen an exponential increase in solar installations in Pakistan, there is a need to further strengthen and streamline regulations and policies to ensure sustainable development of distributed solar.

Net-Metering Policy

NEPRA announced the official National Electric Power Regulatory Authority (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations on September 1, 2015. As per these regulations, any customer of the national grid (having three-phase connection) can avail net-metering facility for small-scale (1kW to 1MW) renewable energy installations. In Pakistan, net-metering is the first policy mechanism of the Policy for Development of Renewable Energy for Power Generation 2006, which has been fully implemented. Section 8.4.2 of the RE Policy provides that subject to technical considerations and without discrimination and upon request by distribution end-users, DISCOs shall enter into a net-metering agreement with qualified end-users, interested in installing the RE system.

Licensing Procedure

Application for net metering: Any applicant, who meets the requirement of Distributed Generator as defined in NEPRA's regulation, submits his application along with the necessary documents to the designated office of the DISCO. The DISCO will acknowledge receipt of application and inform the applicant whether the application is complete in all respect. A Distributed Generator as defined under the regulations 2(k) in NEPRA's net metering rules qualifies to participate in the net metering program. 2(k): "Distributed Generator" means a distribution Company's 3 phase 400V or 11kV consumer i.e. domestic, commercial or industrial and who owns and/or operates the Distribution Generation Facility, and is responsible for the rights and obligations related to Agreement and licensed by Authority under these regulations.

Initial Review: After the receipt of complete application as per the checklist, the DISCO office will perform an initial review to determine whether the applicant qualifies for the interconnection facility and fulfills additional requirements.

Technical Feasibility: After the receipt of complete application as per the checklist, the DISCO office will perform an initial review to determine whether the applicant qualifies for the interconnection facility and fulfills additional requirements.

Agreement: If the DISCO office is satisfied that the applicant qualifies as a DG, then the DISCO and the applicant will enter into an agreement.

Generation License: The DISCO office will send the copy of the agreement between the applicant and the DISCO to NEPRA along with the application for issuance of generation license.

Connection Charge Estimate: After the agreement, if the DISCO feels that up gradation/ modification of network is required, the applicant will receive a Connection Charge Estimate (CCE) from the DISCO for the proposed interconnection facility up to the interconnection point including meter installation. Applications for which no up gradation/ modification is required, no CCE will be issued. The applicant will deposit the Connection Charge Estimate (CCE) in designated Bank and notify the DISCO office in writing. The payment would be made as proposed in the CCE sent by the DISCO.

Installation of interconnection facility: After the applicant makes the payment, the DISCO office will install and commission the proposed interconnection facility after the confirmation of generation license to the DG by NEPRA.

Interconnection Requirements: The regulation also outlines procedures to safely install and connect the distributed generation facility. It is important to note that For the DGs having an installed capacity of more than 500kW, load flow study is compulsory, and for the distributed generation facilities having a capacity less than 500kW, load flow study can be carried out using FDRANA. Load flow study for the facility having capacity up to 10kW is not required.

Barriers to Achieving Potential

There are several barriers to achieving the distributed solar market potential in Pakistan. These barriers, described below, are grouped into four categories:

Legal, regulatory and procedural

- Net-metering: 1-to-1 net-metering may not be the optimal method to encourage and incentivize both customers and DISCOs.
- Without a single window processing facility by the DISCOs, small-scale investors are dissuaded and overwhelmed by the connection and permitting procedures.
- Lack of clarity for provision of distributed generation in multi-family apartment buildings and housing schemes
- Lack of incentives for DISCOs to connect distributed generation facilities.
- Distributed generators cannot trade electricity. This excludes homeowners in the residential sector and firms in the commercial sector, who make up a significant part of the rooftop market, are not allowed to sell electricity. This restriction includes distributed systems of up to 1 MW and poses a challenge to residential and commercial customers since they would not be remunerated for excess power delivered to the grid. As a result many commercial installations are not connected to the grid.

Financial and Tariff

- Lack of incentives: Non-availability of financial incentives, such as VAT exemption or investment initiatives as many other countries have used, does not encourage distributed solar systems. No business models that can be used to incentivize financing in the sector.
- Nascent EPC industry: Not all EPCs are financially and technically competent. Many EPCs are relatively new firms and have weak balance sheets. Consequently, they may not qualify for finance
- Short loan tenures. As some distributed systems, particularly in the industrial sector, have longer payback periods, long-term debt is needed.
- High systems operation fee: For small-scale RSPV systems (between 10 to 250 kW), the system operation fee could potentially limit investment.

Technical Capacity and Awareness of Distributed Solar Systems

- Lack of skilled technicians. A large pool of capable technicians will be needed to handle a major growth in the RSPV market.
- Lack of knowledge on impact of distributed solar on the local and central grid is not well understood.
- Consumer Perception: There is a general lack of information about distributed solar systems, current policies, their costs and benefits, financing options, business models, and technical considerations. Perceptions of consumers including perceived risks of distributed solar adoption.

G. Distributed Solar Market Potential for Sindh and the Sindh Solar Energy Project

Distributed Generation Licenses (Source: NEPRA)

Sr.	DISCO	No of Connecti ons	Installed Capacity
			kW
1	IESCO	133	3467.89
2	LESCO	149	2162.37
3	MEPCO	16	719.53
4	FESCO	12	471.36
5	GEPCO	21	988.32
6	BTPL	15	111.5
7	HESCO	0	0
8	PESCO	0	0
9	SEPCO	0	0
10	K-Electric	5	80.61
11	QESCO	0	0
12	TESCO	0	0
	Total	351	8001.58

The current status of licenses issued by NEPRA by DISCO service area are shown above. In Sindh, just 5 licenses for about 80kW have been issued. In addition to the above there are a few commercial and residential installations that are not connected to the grid and not under license from NEPRA. This demonstrates the need for an intervention to tap the immense potential for distributed solar in an area of the country with the best solar resource potential. In Sindh, this can be led by the public sector which has access to numerous public buildings and space in the thriving metropolises of Karachi and Hyderabad.

Sindh Solar Energy Project

Component 2 of the Project will finance distributed solar PV systems on the rooftops and other available space on and around public sector buildings in the cities of Karachi and Hyderabad. With the sharp decline in global and regional prices, the electricity generated from rooftop solar in Sindh is expected to be around US\$ 6-10 cents/kWh, lower than the retail tariff charged by utilities, as illustrated in Figure 4. By utilizing spare rooftop and other available space on and around public buildings, the program is expected to create a win-win situation for the public sector, the targeted DISCOs, private sector installers/developers, and electricity consumers by: (i) reducing recurrent expenditure on electricity by Government of Sindh, freeing up budget for other priorities; (ii) providing the DISCOs with cost-effective power during periods of high air conditioning load, while allowing the payments to be netted off against outstanding public sector debts; (iii) building private sector experience in constructing and operating large distributed solar PV installations, thereby reducing costs; and (iv) improving the supply of affordable power to consumers. Given the current structure of '1-to-1' net metering regulations, this sub-project is expected to generate significant dialogue as well as operational data to inform government and provincial policies on distributed solar generation, including a potential model for replication and scale-up. Up to 20 MW of capacity could be installed under this component, in a phased manner, depending on the costs obtained. Installing distributed generation near load centers has the intrinsic benefit of adding power capacity without increasing the burden on the

transmission system and providing more energy per MW installed as transmission and distribution losses are largely avoided.

Why the public sector approach?

The proposed public sector approach of Component 2 of the Sindh Solar Energy Project is to generate more solar power and to reduce the bills of public sector institutions and therefore have an impact on the circular debt. It is important to note that although this is a public sector driven approach, it will only achieve the desired results with collaboration from the private sector. The advantage of going the public sector route, especially in the area of rooftop and distributed solar is that no other institution, public or private, has such a vast portfolio of buildings and space as the public sector. Moreover, the public sector's portfolio of buildings includes different types of buildings, such as offices, schools, hospitals, living quarters, etc. This can provide valuable learning in implementing distributed solar. In addition, dealing with one government entity significantly reduces the transaction cost of each subproject for both the public and the private sector.

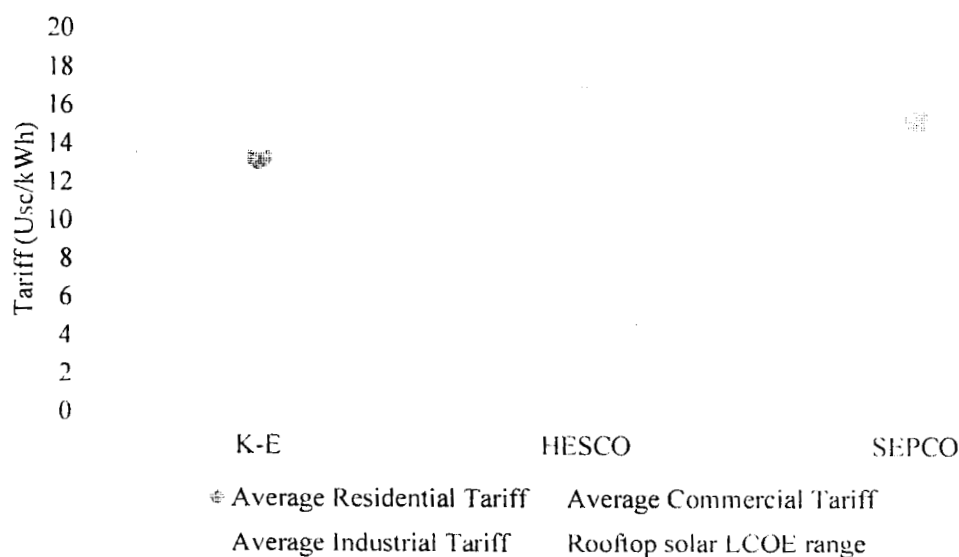


Figure 4: Average cost of Distributed Solar vs DISCO Tariff

Distributed Solar Potential

A study commissioned by the World Bank in 2016,¹ aimed to find the demand and potential distributed solar in Karachi for large public buildings and land parcels, given the available area and load requirement of that institution. The approach of the survey included data collection, tabulation and analysis related to K-Electric system, Karachi Water & Sewerage Board (KWSB), Major Hospitals and 20 Large Public buildings in Karachi city. The survey team visited Karachi and held discussions with concerned officials to fully understand task and objective of the assignment, methodology and approach for data collection particularly related to KWSB, large buildings, hospitals besides K-Electric related data. After detailed discussion five large pumping stations and three sewage treatment plants (since there are many large,

¹ World Bank. 2016. "Demand for Distributed Renewable Energy Generation." Washington, DC. <http://pubdocs.worldbank.org/en/651451464210676719/Report-Demand-Distributed-Renewable-Energy-Generation-Pakistan-Elan-Partners-World-Bank-Jun2016.pdf>

medium and small installations that includes pumping stations and sewage, spread all over Karachi and data collection from all was not possible in limited time of the assignment) was selected. In the same manner five major hospitals and twenty large public buildings also selected. The tables below outline the results of that study:

Karachi Water and Sewage Board

Name of Site	Load (KW)	Available Space (sq. m)	Possible Sites	Estimated Solar Capacity (KW)	Solar Loading Percentage
Dhabeji Pumping Station	28,570	687,970	Vacant Land within Premises & Rooftop	55,038	100
Pipri Pumping Station & Filter Plant	3,200	263,050	Vacant Land within Premises & Rooftop	21,044	100
North East Karachi Pumping Station	5,340	182,110	Vacant Land within Premises & Rooftop	14,569	100
Hub Pumping Station	8,440	10,696	Vacant Land within Premises & Rooftop	856	10
Gharo Pumping Station & Filter Plant	1,650	40,470	Vacant Land within Premises & Rooftop	3,238	100
Sewage Treatment Plant-I	270	187,850	Vacant Land within Premises & Rooftop	15,028	100
Sewage Treatment Plant-II	1,020	47,000	Vacant Land within Premises & Rooftop	3,760	100
Sewage Treatment Plant-III	880	58,000	Vacant Land within Premises & Rooftop	4,640	100
Total	49,370	1,477,146		118,218	

Major Hospitals

Name of Hospitals	Load (KW)	Available Space (sq m)	Possible Sites	Estimated Solar Capacity (KW)	Solar Loading Percentage
Abbasi Shaheed Hospital	1,110	7,300	Car Parking & Rooftop	584	52
Civil Hospital	2,350	16,400	Rooftop	1,300	55
Jinnah Post Graduate Medical Center	3,190	80,000	Vacant Land within premises & Rooftop	6,400	100

Sindh Services Hospital	200	800	Vacant Land within Premises & Rooftop	64	32
Lyari General Hospital	540	6,000	Vacant Land within Premises & Rooftop	480	88
Total	7,390	110,500		8,828	

Large Public Buildings

Name of Public Buildings	Load (KW)	Available Space (Sq. m)	Possible Sites	Estimated Solar Capacity (KW)	Solar Loading Percentage
Mazar-e-Quaid	387	140,899	Vacant Land within Premises & Rooftop	11,271	100
Radio Pakistan Karachi	60	3,400	Vacant Land within Premises & Rooftop	272	100
KDA Head Quarter	911	45,600	Vacant Land within Premises & Rooftop	3,648	100
Hockey Stadium Karachi	133	26,400	Vacant Land within Premises & Rooftop	2,112	100
SSP South Police Head Quarter Garden	334	-	Vacant Land within Premises & Rooftop	-	-
National Stadium Karachi	211	160,000	Vacant Land within Premises & Rooftop	12,800	100
Pakistan Railway Station, Karachi Cantt.	316	270,000	Vacant Land within Premises & Rooftop	21,600	100
Karachi Port trust Building	-	4,500	Vacant Land within Premises & Rooftop	360	
Pakistan Television Karachi Center	530	6,000	Rooftop	480	90
Sindh Madressatul Islam Building	369	10,000	Vacant Land within Premises & Rooftop	800	100
Karachi Municipal Corporation Building	328	9,000	Vacant Land within Premises & Rooftop	720	100
State Bank Building, Karachi.	1,638	3,500	Vacant Land within Premises & Rooftop	280	17

Frere Hall, Karachi	661	60,000	Vacant Land within Premises & Rooftop	4,800	100
Liaquat Memorial Library	77	5,000	Vacant Land within Premises & Rooftop	400	100
Quaid E Azam House Museum, Karachi	42	8,500	Vacant Land within Premises & Rooftop	680	100
Zoological Garden, Karachi	189	121,100	Vacant Land within Premises & Rooftop	9,688	100
National Museum Karachi	163	57,000	Vacant Land within Premises & Rooftop	4,560	100
Khaliq Dina Hall Library	45	2,300	Vacant Land within Premises & Rooftop	184	100
Superme Court Registry, Karachi	175	2,200	Vacant Land within Premises & Rooftop	176	100
Mohatta Palace, Karachi	109	11,500	Vacant Land within Premises & Rooftop	920	100
Total	6,678	946,899		75,751	

An analysis of public buildings and land at the Karachi Water and Sewage Board, Major Hospitals and Large Public Buildings revealed that about 203MW of distributed solar could be installed at those sites.

The Framework Approach

Given the numerous amount of public building and land holdings, an assessment of all buildings is neither feasible, nor is it advantageous. With this initial survey it can be established that government buildings, just in Karachi, have the potential to be used for a significant capacity of distributed solar. While this initial survey establishes the potential for public installations of distributed solar, a framework approach is needed to effectively select buildings for distributed solar. A framework approach ensures that a building is being chosen according to well defined parameters and the objectives of the program.

Under the Sindh Solar Energy Project, buildings will be chosen according to the following criteria:

Item	Criteria
Ownership	Buildings selected must be wholly owned and managed by Government of Sindh
Building rooftop	<ul style="list-style-type: none"> • Rooftop areas should be without shading or have minimal shading • The roof structure must be level and accessible
Safety and structural integrity Requirements	All buildings selected for the rooftop component of the pilot and the larger program must meet the requirements of the Building Code of Pakistan. Buildings which are not up to par with the Building Code of Pakistan will be excluded

Building Selection	<ul style="list-style-type: none"> Selected buildings must not be a protected site and checked against: <ul style="list-style-type: none"> The list of archaeological sites and monuments in Sindh protected by the Federal Government (under the Antiquities Act 1975) List of heritage buildings issued by the Sindh Building Control Authority (under the Sindh Cultural Heritage Act 1994) Building must be built and/or renovated in the last 30 years (1988 onwards)
Building Load	Building must have usage/load on all 7 days of the week and be operational for at least 10 years from the start of the pilot program. When the structure of the gross-metering (utility off-taker) model, has been agreed with K-Electric, the system capacity will not be subject to building load limitations

While the distributed solar installations will be made according to the following criteria:

Item	Criteria
Capacity	<ul style="list-style-type: none"> For smaller sites or those with limited available space, the solar PV system installed will be sized below the building or site's peak load. This will require the developer to perform an energy audit of the building. For larger sites, the solar PV system will be sized to maximize generation, within the limits of the available sub-station capacity and other constraints. This will require an EPA to be signed with the DISCO covering a portfolio of such sites.
System	<ul style="list-style-type: none"> All solar rooftop installations will adhere to the relevant guidelines of the Building Code of Pakistan, for rooftop structural stability, and the International Building Code, for installation of PV module mounting structures. All components of system, including, the PV modules, inverters, fuses, arrestors, cables, chemical earthing, junction boxes, meters and mounting structures must adhere to relevant the standards (IEC, UL, etc.). For coastal and highly corrosive environments, specifically Karachi, developer must use appropriate equipment, for e.g., aluminum for the mounting structures, environmentally tested PV modules, conditioners and inverters
Financial Arrangements between developer and off-taker	Initially developers will install and operate their portfolio of sites under a performance based O&M contract based on the production from each site. Hence the developer will be incentivized to appropriately design the system (avoiding any shading and highly polluted areas, installing dust filters), and have an optimal maintenance schedule. Once experience is generated the Proposed Program may explore models whereby the developer arranges their own financing, and is the owner of their portfolio of sites.

Financial Arrangements between developer and building owner	✓ Government of Sindh will lease the roof from each individual public sector building owner, ensuring rights to access the roof during normal working hours for installation and maintenance. In addition, a small 'leasing fee' will be paid to each building owner to facilitate cooperation and continued access to the sites.
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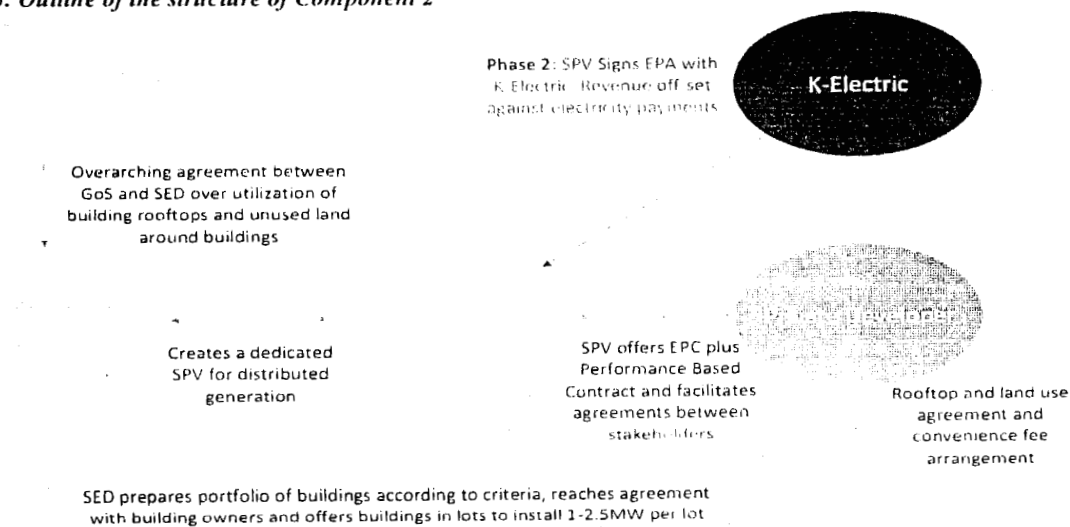
A framework approach is necessary to allow the private sector to come into the process early on. While incentivizing performance, the framework approach can ensure that the most optimal buildings will be selected for the project. The framework approach allows the government to establish a master leasing agreement with a selection of buildings and then organize a competitive bidding for detailed building and structural surveys, and construction of the distributed solar plants. It is expected that establishing leasing agreements with the buildings will take some time, hence, this will be done over time and would allow the government to successive rounds of biddings for a portfolio selected sites over time.

II. Operating Models

SED (Sindh Energy Department) will identify portfolios of candidate sites based on the aforementioned pre-defined criteria, and would liaise with other GoS departments to establish a master leasing agreement at the inter-departmental level. This arrangement will be a critical element of the project to ensure a streamlined process prior to project award. Once a portfolio of sites is developed, SED would organize a competitive bidding for detailed building and structural surveys, and construction of the distributed solar plants on an EPC basis for the capital investment, combined with a long-term, performance-based O&M contract. Bids would be evaluated on the basis of both the capital and the O&M cost. To ensure the winning bidder meets its contractual obligations, payments will be structured to cover costs upfront, while profits will be earned over the lifetime of the contract, initially envisaged as a five-year contract. Construction contracts may include installation of energy management systems to improve the understanding of energy usage and facilitate future energy efficiency upgrades.

The Project would include larger sites if agreements can be reached with the respective DISCOs for power off-take, either through existing net metering regulations, or via a negotiated tariff. Discussions have already taken place with K-Electric, who indicated their willingness to purchase solar power output from a publicly-owned SPV so long as the costs are competitive and acceptable to NEPRA. If this can be arranged, larger sites where the total peak solar power output is higher than the building's peak daytime load would be selected, with the excess power sold to the DISCO. Where there is outstanding GoS debt to the DISCO, then the payments for the exported power could be partially offset against this debt, while ensuring some allowance is made for payments to SED to cover O&M costs. This model provides DISCOs with a potential alternative to net metering, and an attractive way to further reduce the circular debt problem. Longer term, business models with a stronger private sector financing component could be explored.

Figure 5: Outline of the structure of Component 2



Initial learning from the project before scaling up:

- (a) With the above design, SED and the World Bank will get a sense of the financing requirements, convenience fee/leasing arrangements for local developers to scale-up.

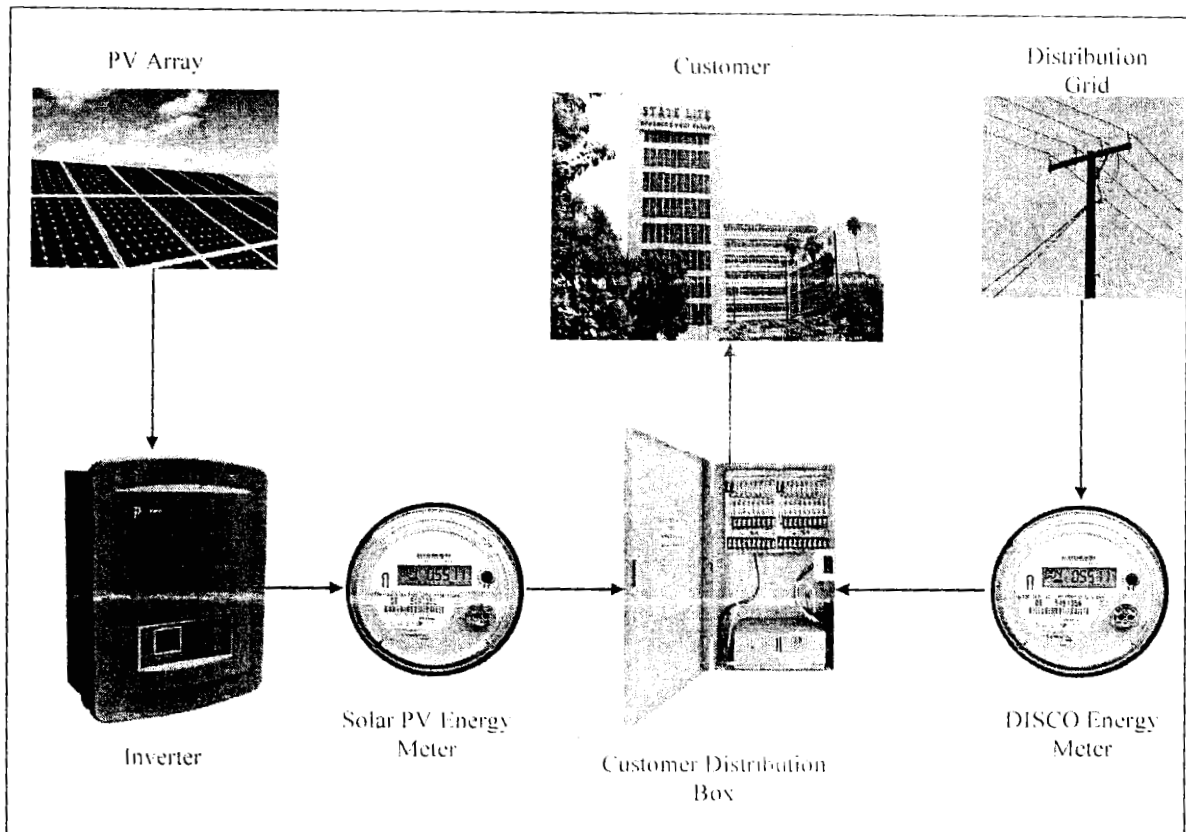
- (b) Initially the capital costs will be borne by SED, but as the program scales-up there may opportunities to better leverage public resources to bring in commercial capital for long-term expansion of the program. This could include partial public financing, or providing developers access to lower cost capital through a line of credit established in a local bank(s).
- (c) Developers will be mandated to use state-of-the-art monitoring systems which will help inform the design of the larger program.
- (d) Leasing/convenience fee of rooftops for the program may mimic existing arrangements for telecommunications towers. Leases will be revised after the first year of the program.

Moving Forward

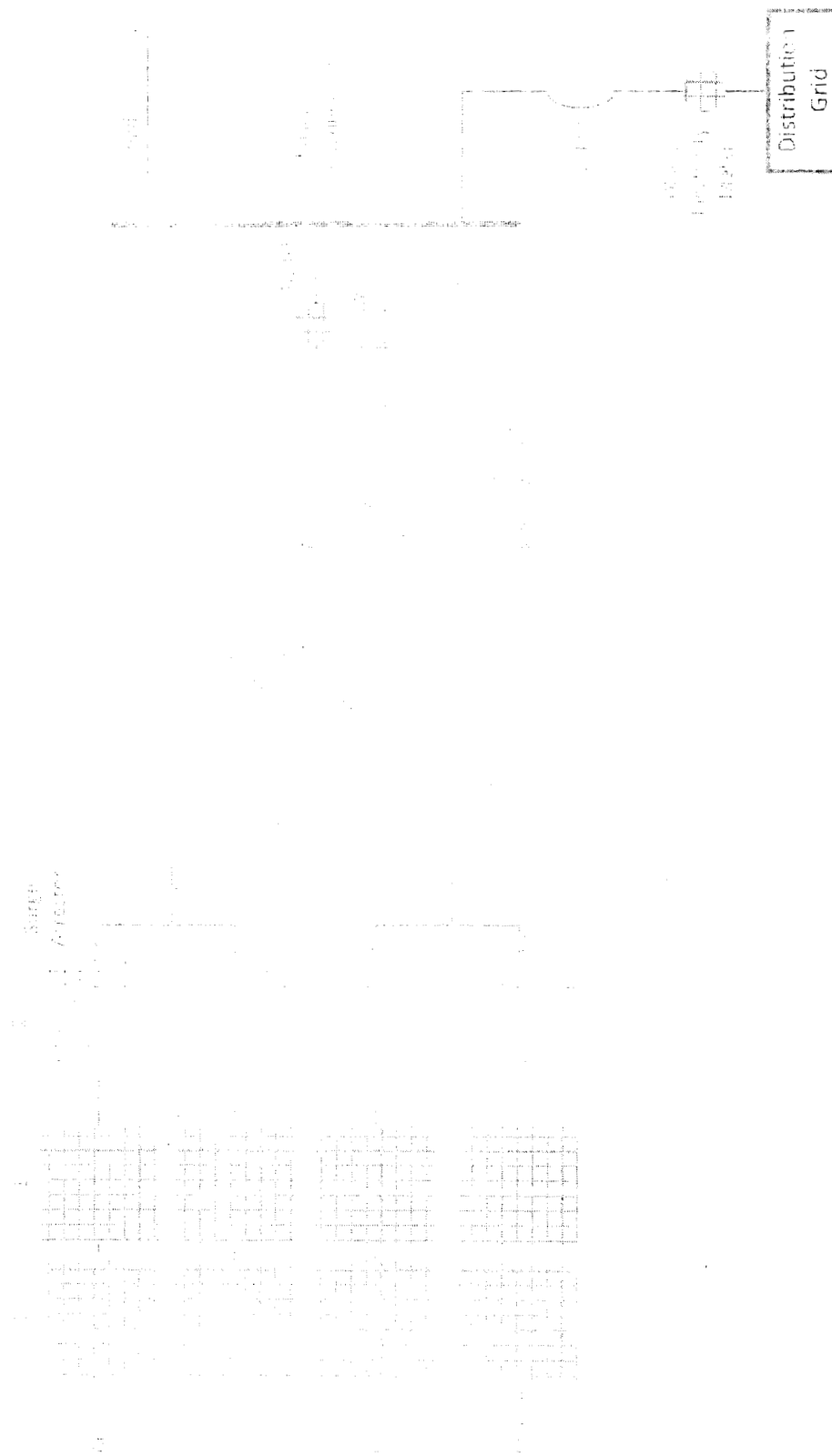
Using global best practices in scaling-up rooftop solar and tailoring to the Pakistan and specifically the Sindh context, several business models will be designed and tested for the Project. In the longer term, the Project would explore models for a stronger private sector role, including partial or full private sector financing and ownership of the distributed solar plants. Such a model may be less attractive to the DISCOs, due to the reduced ability or inability to net off the EPA payments against public sector electricity debts, but with continued reductions in the capital cost of solar PV, possible increases in the retail tariff, and maturing of the market, such models may become feasible during the course of the Project. As additional business models are explored the Project will also look into incorporating energy efficiency and energy management systems to decrease energy consumption of public buildings.

I. Technical Specifications and Best Practices

Block Diagram of Representative Distributed Solar Facility



Single Line Diagram of Representative Distributed Solar Facility



Quality Standards

Quality certification and standards for distributed solar PV systems are essential for its successful implementation. It is also imperative to put in place an efficient and rigorous monitoring mechanism, to ensure adherence to these standards.. The relevant standards and certifications for a grid-connected rooftop solar PV system/plant (component-wise, up to L.V-side) are given below:

Solar PV Modules

IEC 61215	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61646	Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules
IEC 62108	Design Qualification and Type Approval for Concentrator Photovoltaic (CPV) Modules and Assemblies
IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules (As Applicable)
IEC 61853- Part 1	Photovoltaic (PV) module performance testing and energy rating -- Irradiance and temperature performance measurements, and power rating
IEC 62716	Photovoltaic (PV) Modules – Ammonia (NH ₃) Corrosion Testing (Advisory - As per the site condition like dairies, toilets)
IEC 61730-1,2	Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction, Part 2: Requirements for Testing
IEC 62804	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation (PID). IEC TS 62804-1: Part 1: Crystalline silicon (Mandatory for system voltage is more than 600 VDC and advisory for system voltage is less than 600 VDC)
IEC 62759-1	Photovoltaic (PV) modules - Transportation testing, Part 1: Transportation and shipping of module package units

Solar PV Inverters

IEC 62109-1 IEC 62109-2	Safety of power converters for use in photovoltaic power systems Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)
IEC 61683 (For stand Alone System)	Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
BS EN 50530	Overall efficiency of grid-connected photovoltaic inverters: This European Standard provides a procedure for the measurement of the accuracy of the maximum power point tracking (MPPT) of inverters, which are used in grid-connected photovoltaic systems. In that case the inverter energizes a low voltage grid of stable AC voltage and constant frequency. Both the static and dynamic MPPT efficiency is considered.
IEC 62116 UL 1741 IEEE 1547	Utility-interconnected Photovoltaic Inverters - Test Procedure of Islanding Prevention Measures
IEC 60255-27	Measuring relays and protection equipment - Part 27: Product safety requirements

IEC 60068-2 (1, 2, 14, 27, 30 & 64)	Environmental Testing of PV System – Power Conditioners and Inverters
IEC 61000-2,3,5	Electromagnetic Interference (EMI), and Electromagnetic Compatibility (EMC) testing of PV Inverters (as applicable)

Fuses

IEC 60947 (Part 1, 2 & 3),	General safety requirements for connectors, switches, circuit breakers (AC/DC)
IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems

Surge Arrestors

IEC 61643-11:2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods
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Cables

IEC 60227 IEC 60502	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation)
BS EN 50618	Electric cables for photovoltaic systems (BT(DE/NOT)258), mainly for DC cables

Earthing/Lighting

IEC 62561 Series(Part 1,2 & 3) (Chemical earthing)	IEC 62561-1 Lightning protection system components (LPSC) - Part 1: Requirements for connection components
	IEC 62561-2 Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes
	IEC 62561-7 Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds

Junction Boxes

IEC 60529	Junction boxes and solar panel terminal boxes shall be of the thermo plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use
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J. Total Cost of the Project

The total cost of Component 2 is US\$ 25 million, with an EPC cost of about US\$ 20 million. This will suffice in providing at least 20 MW of distributed solar to public buildings in Sindh. The breakdown for the Component 2 is provided in the table below. The cost estimate is deliberately conservative, to ensure sufficient funding to meet the 20 MW target, but if EPC costs turn out to be lower than estimated then this will enable additional capacity to be installed under the Project.

Item	Indicative budget
Building identification and mapping, including LIDAR/satellite-based analysis	\$500,000
Building analysis and selection	PMU staff time
Leasing agreement between SED and GoS departments (legal fees)	\$100,000
Transaction advisory services	\$600,000
EPC cost (20 MW)	\$19,700,000
O&M for five years (20 MW)	\$1,760,000
Building Energy Management System (15 Buildings)	\$1,900,000
Contingency	\$440,000
Total Cost	\$25,000,000

K. Detailed Feasibility (Economic and Financial Analysis)

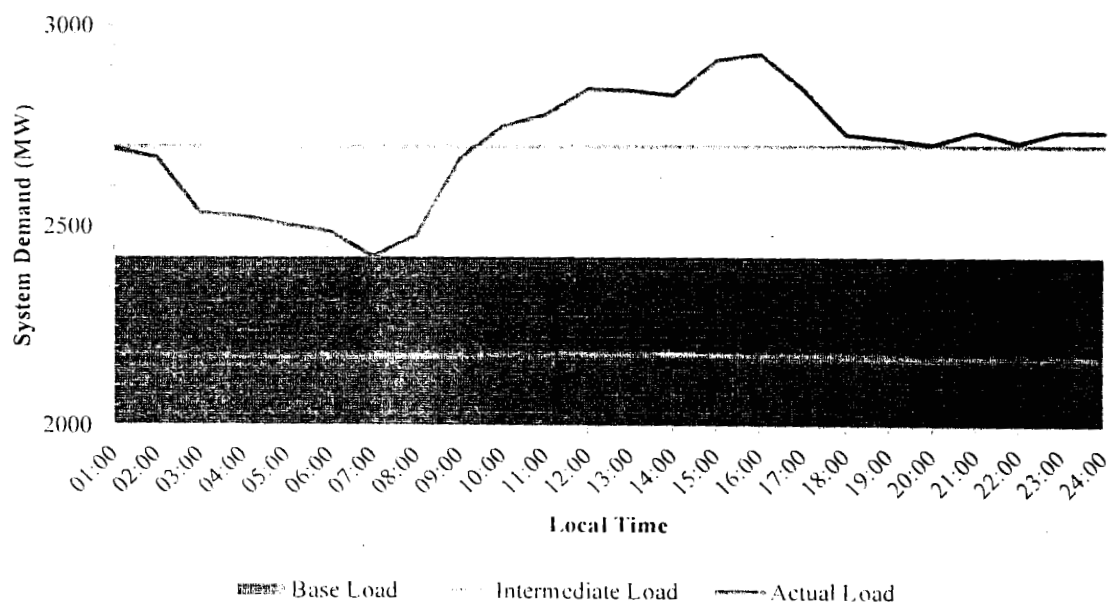
As Component 2 of the Sindh Solar Energy Project will adopt a framework approach to selecting sites, a representative feasibility study can be conducted to demonstrate the economic and financial impact of distributed solar for the Government of Sindh.

Existing Power System and Electricity Consumption

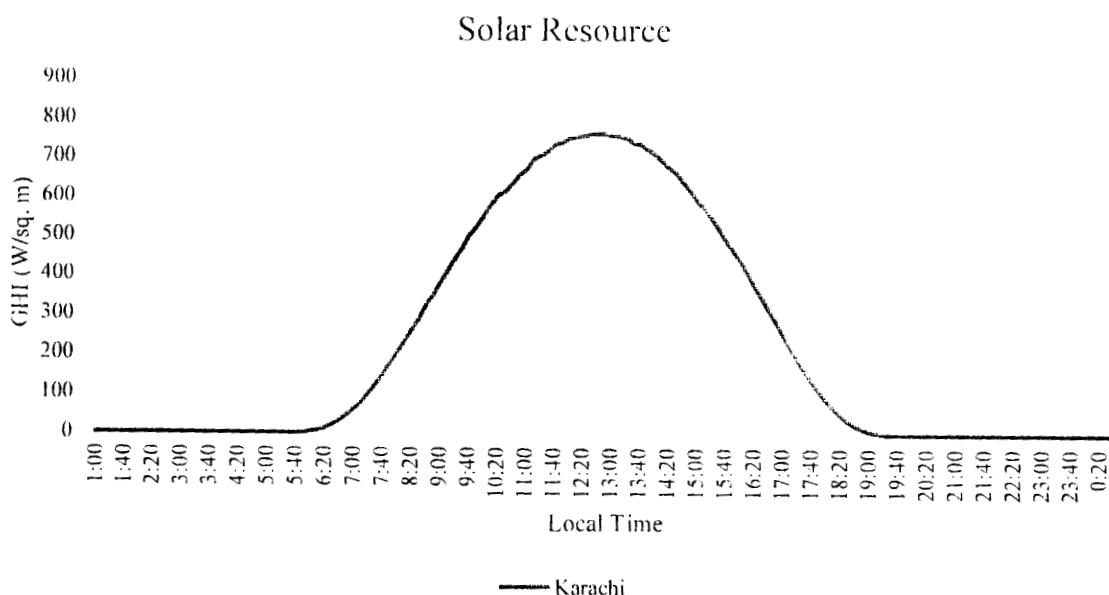
In Section G, an assessment based on a survey of potential sites for Component 2 was presented. A summary of that assessment is presented below.

Parameter	KWSB	Major Hospitals	Public Buildings
Peak Demand of Facilities Surveyed (MW)	49	7	6
Annual Electricity Consumption (GWh)	283.12	24.93	19.42

The representative system load curve below for the city of Karachi shows that system demand in the city has two peaks. A shorter peak which occurs around midday and a larger peak, which occurs around late afternoon.



The system load curve, above, can be corresponded with the solar resource, illustrated below. The solar resource closely corresponds to the mid-day peak demand in the city of Karachi. With the system load and the solar resource figures, it can be concluded that the energy generated from distributed solar can be fully consumed at the time of generation.



PV Plant Capacity Assessment

Parameter	KWSB	Major Hospitals	Public Buildings
Peak Demand of Facilities Surveyed (MW)	49	7	6
Annual Electricity Consumption (GWh)	283.12	24.93	19.42
Space Available (sq. m)	1,477,000	110,500	949,800
Potential Solar Capacity Installed (MW)	188	9	75

As the table above shows, the estimated solar PV array capacity that can be installed on the representative available area is about 272MW, however, with the scope of the project, only 20MW will be installed.

Estimation of Energy Yield

Energy Balance		2019	2020	2021	2022	2023	2024
Installed Capacity	[MW]	20.00					
Capacity Factor	[units]	0.19					
Energy Produced	[GWh]		29.96	29.81	29.66	29.51	29.36
Transmission loss avoided	[GWh]		3.33	3.31	3.30	3.28	3.26
Energy Displaced from alternative source	[GWh]		33.29	33.12	32.96	32.79	32.63

With an installed distributed solar capacity of 20MW, given the strong solar resource, about 30GWh of electricity will be generated annually. This comes to a capacity utilization factor of about 19%. Taking into account the substantial transmission and distribution losses in the grid, an equivalent of about 33GWh of grid electricity will be displaced.

Estimation of GHG Emission Reduction

Given an average grid emissions factor of 0.59 tCO₂e/MWh, annual GHG emissions reductions will be about 22,000 tons of GHG. Over the lifetime of the project, taking into account the degradation overtime of the distributed solar facility, about 435,000 tons of GHG emissions will be avoided.

Economic Analysis

The counterfactual for the Distributed Solar was assumed to be the same marginal generation source: HFO and LNG based plant. However, the transmission loss avoided was taken into account in the economic benefits calculation. The capacity credit was again assumed to be 0% to keep the ERR and ENPV estimates conservative. The energy balance for the first five years after installation are shown below.

The economic analysis of 20 MW Distributed Solar indicates that the project is economically viable with a ERR of 20.5%. The capex for the distributed solar was assumed to be \$1.03/W² with a capacity factor of 19%³. The key assumptions used are shown below. After accounting for the cost of avoided GHG emissions, the EIRR further increases to 27.7%. The lifetime GHG emission reduction is projected to be 435,180 tons CO₂ equivalent. The net economic benefit (with externalities) for this component is estimated at \$33 million.

The Capex is based on discussions with distributed solar companies and Generation License Applications to NEPRA for distributed solar, which detail the cost for each distributed solar facility. This was chosen as the most reliable and representative source as the system sizes will be similar to that for the Project. For consistency, this was checked against NREL's US Solar PV System Cost Benchmark and the Generation License Applications of utility-scale solar projects. IRENA's Solar and Wind Cost Reduction Potential to 2025 was used to scale the costs for 2018.

Economic Analysis Assumptions and Results for 20 MW Distributed Solar

Assumptions	
PV system CAPEX	\$1.03/W
OPEX (% of CAPEX)	2%
Capacity factor	19%
Degradation of PV output	0.5% p.a.
Transmission loss avoided	10%
Lifetime	20 years
Economic/social discount rate	6%
Results	
EIRR (without environmental externalities)	20.5%
EIRR (with environmental externalities)	27.7%
GHG Emissions	435,187 tons
ENPV	\$21.8 m
ENPV (with externalities)	\$33.0 m

Financial Analysis

² Estimated based on 'NEPRA Generation License Application' and 'IRENA Cost Reduction Potential to 2025'

³ Capacity factor for rooftop solar is assumed to be slightly lower than utility component due to soiling, dusting and shading.

The financial analysis of Component 2 from the perspective of the public-sector building owners indicates that distributed solar component of this project is financially viable with a project FIRR of 22.3%. The revenue assumed for the financial analysis is the economic savings from not using the grid electricity, which is \$0.16/kWh⁴. The component is assumed to be fully IDA financed. Additional assumptions for the financial analysis are shown below. The financial NPV of the component over 20 years is estimated at \$26.7 million.

Financial Analysis Assumptions and Results for 20 MW Distributed Solar

Assumptions	
Equity portion	0%
Debt portion	100%
Debt Terms	3.3%, 20 years tenor, 5-year grace period
WACC	3.3%
Grid Electricity Tariff avoided	\$0.16/kWh
Roof lease paid to the building owner	\$0.01/kWh
Deflator	3.6%
Results	
Project FIRR	22.3%
FNPV	\$26.7 m

Sensitivity Analysis

To assess the robustness of the economic feasibility of distributed solar in terms of its capex, a sensitivity analysis was conducted. The switching value for the capex is \$2.11/W indicating that the investment is economically highly robust in case of cost overrun by over 100%.

To assess financial feasibility of the investment, a sensitivity analysis was conducted on the i) Interest rate of the debt and the ii) Avoided grid electricity tariff. Results show that the switching value of the interest rate on the debt is 16.5% indicating that once the pilot has been established and the necessary technical capacity has been built, distributed solar could easily leverage on commercial financing at higher interest rates. The results on the sensitivity to avoided electricity tariff indicates that the component is financially not viable if the grid electricity tariff drops by 25% to \$0.119/kWh from a base value of \$0.16/kWh. The summary of the sensitivity analysis is shown below.

Switching Values of 20 MW Distributed Solar

	Base Value	Switching Value
EPC cost	1.03	2.11
Interest rate	3.3%	16.51%
Grid Tariff	0.16	0.119

⁴ Retail tariff as indicated by K Electric

Sindh Solar Energy Project:

***ANNEX 3 – Feasibility of Solar Home
Systems in Sindh [Component 3]***

May 2018

Feasibility Study of Solar Home Systems for Households with No/Low Access to Electricity

A. PROJECT TITLE:

Sindh Solar Energy Project: Component 3 - Solar Home Systems for Households with No/Low Access to Electricity

B. INTRODUCTION:

At present energy crisis in Pakistan is of serious concern as it is affecting the economic growth of the country. The power sector in Pakistan is largely dependent on imported fuel based thermal power generation. Though, the installed capacity in Pakistan is nearly equal to the current demand, however, capacity of most of the installed power plants has de-rated and some are not running to their full capacity due to fuel constraints. The dependable capacity in Pakistan is 17,897 MW in summer and 13,215 MW in winter against demand of 23,000 MW and 17,000 MW in summer and winter respectively¹. This is resulting in creating a supply demand gap situation. Due to huge deficit in supply and demand, the load shedding must be carried out for better power management.

Besides this, 1/3rd of the population in Pakistan is not connected to the grid supplied electricity². As per the statistics available with the federal and provincial government departments, there are more than 40,000 villages all over Pakistan which are yet to be connected to the national grid; out of which 8,000 villages are situated way beyond locations where it is technically and financially unviable to extend the national grid³. The communities residing in these remote areas are still relying upon kerosene, conventional lanterns, candles and cell batteries as the lighting source.

Similarly, the piped natural gas is available to 21% of the population of Pakistan⁴. Remaining 79% (mostly in villages) are dependent on alternate options like burning of biomass, fuelwood, cow dung, kerosene oil etc. for meeting their heating requirements.

This is one of the reasons that these communities have remained under developed. Burning of these conventional fuels is also causing huge health hazards to the population of these areas, especially to the women and the children. It is reported that in Pakistan, more than 110,000 deaths occur annually due to indoor air pollution⁵.

Project Rationale: According to census 2017 figures released by Pakistan Bureau of Statistics division, the total number of households in Sindh was 8,585,610. NEPRA in 2016, reported a total number of domestic connections of 3,174,116 in Sindh. This translates into an electricity access rate of 37% for Sindh, with roughly 5,411,494 households without electricity connections. It has been challenging to locate these households, as they are scattered in various pockets across Sindh. Currently, national level estimates and survey-based studies do not provide the precise level of geographic detail to enable the government to efficiently target their increase in energy access efforts. Acknowledging this problem, Government of Sindh has initiated village electrification program in Sindh Province through clean solar energy solutions. World Bank has very kindly agreed to support Government of Sindh in this regard.

¹ State of Industry Report, 2014, NI PRA

² NIDC

³ WAPDA, DISCOs and Provincial Energy Departments

⁴ OGRA

⁵ WHO

In a bid to alleviate poverty and improve standard of living of masses residing in remote areas of Pakistan, which are still deprived of basic energy needs, this feasibility study is prepared that compares various options for electrifying remote off grid or low energy access households of the Sindh province and provides a workable solution for including in as a Component 3 of the overall Sindh Solar Energy Project (SSEP, or the 'Project') being undertaken by Government of Sindh supported by World Bank financing. This Component aims to provide electricity access to 200,000 households (representing 1.2 million people on average) through provision of solar home systems (SHSs) by private sector 'solar solution providers' (SSPs), with Government of Sindh providing a partial grant to help cover some of the upfront cost.

C. OPTIONS TO PROVIDE ENERGY SUPPLIES TO REMOTE VILLAGES:

There are basically three options or scenarios for the provision of energy supplies through off-grid applications: utility network grid-connection via grid extension, off-grid solar stand-alone systems and distributed-grid systems (often known as mini-grid systems).

Table 2: Electricity interventions and their potential effect on access

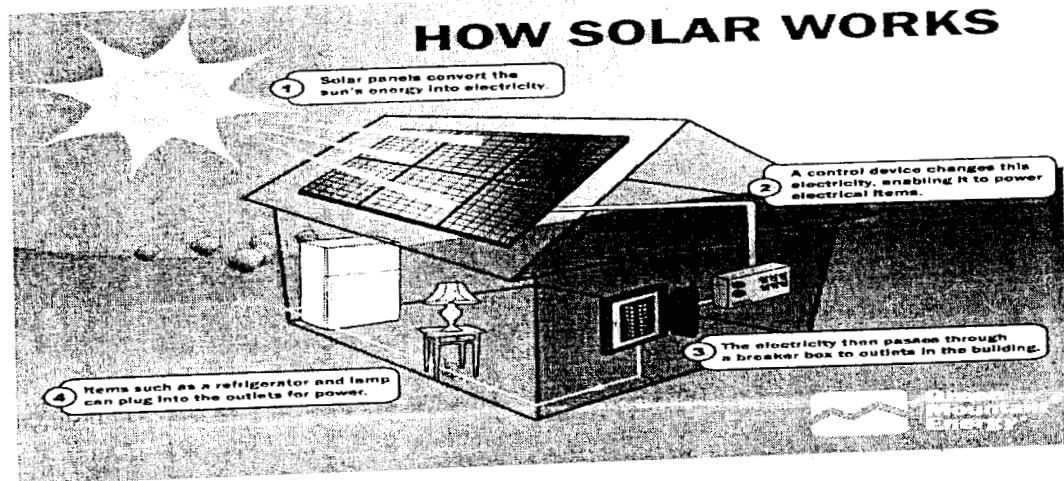
	Project type	Grid connections	Legality	Peak capacity (W)	Duration (hours)	Evening supply	Quality (voltage)	Reliability (outages)	Affordability
Typical energy access projects	Grid electrification								
	Mini-grid electrification								
	Off-grid and solar lanterns								
Other energy projects	Generation and X-border T/M								
	Transmission and distribution								
	Rural feeder segregation								
	Energy efficiency								
	Regulations and market reform								

Positive impact of intervention on energy attributes

SOURCE: ESMAAP 2014

Pakistan is blessed with a huge renewable energy (solar, wind, small hydro, biomass/waste to energy etc.) potential. The potential is feasible for various applications. Solar energy is widely and abundantly available in the country with a huge solar potential of more than 5-6 kWh/m²/day of irradiation in many areas. The potential is feasible for both Solar PV and Solar Thermal application. Even the areas with the lowest solar potential of Pakistan have the best solar resource compared to most of Europe thereby ensuring better energy yield.

Various renewable energy applications can be deployed in remote villages. However, under this project solar home solutions are considered to provide electricity to remote villages of the Sindh Province.



C.2 Solar Energy: An Opportunity for Electricity generation

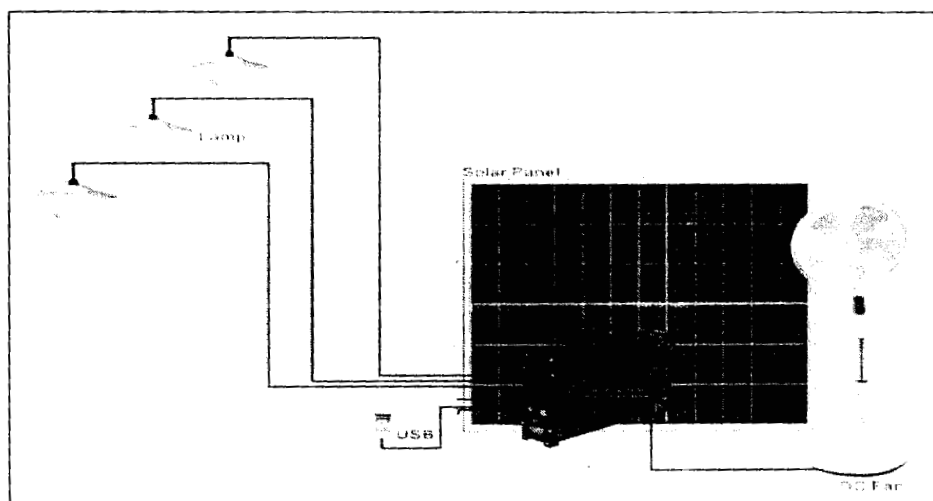
Solar energy is an environmentally friendly source of energy and it does not cause any negative environmental impact. The use of low-cost technologies keeps costs of electrification under control. Sustained support and long-term funding will guarantee more effective policies. The establishment of a

strong market infrastructure to attract private investors ensures the wider use of stand-alone systems in remote areas. Effective billing and payment recovery by off-grid SSPs ensures the long-term viability of provision of electricity in a sustainable way.

Full involvement of the rural communities in the electrification efforts throughout the decision-making process increases their sense of ownership and brings support to utilities' efforts to encourage customers

to use electricity wisely once they are connected. Good management and maintenance of the systems require adequate training, assistance services and customer supply chains for their long-term use. In addition to this, the quality of off-grid solar home systems being used is critical for the success of an off-grid rural electrification program.

The most widely used renewable energy technologies for rural electrification is described below. In 2017, the global off-grid solar (OGS) sector is providing improved electricity access to an estimated 73 million households, or over 360 million people, thus transforming lives that were previously reliant on kerosene and solid fuels for most of their lighting needs⁶. Particularly attractive for countries with ample sunlight and whose rural electricity grid is poorly developed, PV systems can provide electricity to relatively dispersed populations but also to groups of houses or entire villages. The most common systems used in rural areas in developing countries are solar home systems (SHS), which have the potential to power light bulbs and small appliances such as televisions, radios or fans. Generally, the capacity of the units used in rural households ranges from 50 to 300 peak watts. However, because of the systems' limited capacity, mechanisms are often needed to prevent excessive consumption by users.



C.3 Social and Economic Benefits of Rural Electrification

Besides the social benefits, decision makers tend to give more importance to the economic impact of access to electricity as an income-generating process. Electricity use is expected to lead to more productive processes; the growth of businesses or farms using electricity will then increase demand for electricity, leading to a virtuous growth cycle profitable to both electricity providers and rural communities. Such economic growth is obviously an important achievement of any rural electrification programme. Some experts (Barnes, 2007), however, warn that the necessary conditions for such economic growth lie in parallel to or complementary development programs are required for the newly electrified communities. While electricity is indeed an important input to rural businesses, farms or other small rural structures, adequate local conditions such as organized rural markets and sufficient credit are necessary for such businesses to grow. Lack of such complementary development programmes in these regions may hinder their economic growth.

⁶ Off-grid Solar Market Trends Report, GOGIA & IFC, 2018

Electric Power helps improve quality of Life, offer opportunities for income generation and helps reduce the exodus to major cities. At the household level, electricity is mainly used for powering light bulbs, fans, television sets, computers and phones (when available). For over 30 years the World Bank and other organizations have studied the social benefits of electricity access and have noted that these benefits usually derive from the longer days that powered light bulbs offer to the household. In addition, access to information, communication and health care is facilitated by the powering of computers and phones.

When electricity is used for powering home appliances, household chores tend to become less tedious; when it is used for lighting, the relative brightness of the light bulb as opposed to candle light allows children to read or study in the later hours of the day, bringing obvious educational benefits.⁷ Women and children benefit directly from these improvements, but table or ceiling fans and television sets offer comfort during evening leisure time, increasing the general welfare of all members of the household. Social fairness can be one of the initial driving motivators in the first stages of electrification. Indeed, economic development will follow sooner or later once the households have basic energy access services. Minimizing trial and error through benchmarking and exchanges with other countries accelerate the electrification process. Co-operation in the framework of IEA Implementing Agreements for exchanges on technologies and support in policy formulation will spur the electrification process and facilitate long-term collaboration with other countries on other policy and technology issues of interest. In addition, having access to electricity inspires people to continue to improve their homes and their communities.



⁷ It has been proven by a case study in India by Sunny Money, that bright solar lighting successfully **increased daily study time and positively impacted test scores**. The background of the students was that they relied on kerosene lamps for studying at night, they experienced power cuts at night, and the district was extremely impoverished and only **67%** of the students passed the Secondary School Leaving Certificate (SSLC) exams. Two months before the SSLC exams, 84 students were lent high quality off-grid solar lanterns. The results were as follows:

- Daily study time increased by 2-3 hours each night
- **82% of the students passed their SSLC exams** and earned their certificates. This performance was significantly higher than the district average of 67%.



D. Developmental Implications of Off-Grid Technologies

Real costs are of course the fundamental criterion for identifying technologies. But it also necessary to consider other sustainable development implications of the near and long-term technological options. In particular, their efficiency, accessibility, employment generation potential, their relationship to urban areas and environmental sustainability have to be considered.

D.1 Key Parameters for Implementing Off-Grid Energy Strategies

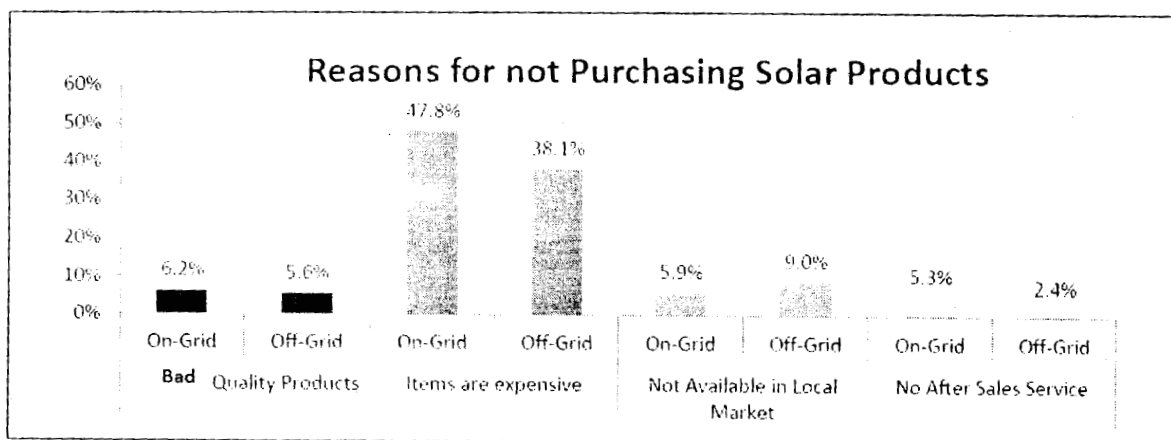
- The implementation mechanism should be carefully designed for immediate-term, medium-term and long-term time horizons and should have focus on technology development and dissemination to end users. The immediate requirement at present is improvement of energy services to the end consumers.
- People's participation (in particular for the supply of resources and payment for services) as households and/or as a community in the overall program is imperative. The implementation mechanism should include key role of the end consumers as users, operators and entrepreneurs in off-grid energy systems.
- Capacity building of the consumers to establish and operate off-grid energy systems is essential for sustainable operations. Training and capacity building of locals in the matter of hardware (technology) and "software" (particularly management) should be part of the implementation mechanism.
- Government should participate in overall implementation to provide an enabling environment. This can be in shape of overall management, training capacity building, consumers' soft

financing schemes, standardization and creating equal participation opportunities, and grants where needed.

- Institutionalizing the implementation of off-grid energy solutions at the consumer level is important to have transparent, accountable and regular functioning.
- Community-based supply of energy sources should be a priority when the cost of sources for number of households (i.e., cost of generation) plus the cost of the distribution network is less (i.e., more cost-effective) than the cost of number of household-level sources.
- Unlike conventional energy sources/end-use technologies, most new rural energy technologies are in the process of maturing. Their costs are declining because of technological advances and organizational learning. Hence, it is important to promote **technological advances** and **organizational learning**.
- The grants allowed by the Government as a policy instrument, should be time-bound and must be justified on the basis that they are promoting technological advances and organizational learning.
- The technology options for off-grid energy supplies should be selected on the basis of available resource, technology, ease of use, adaptability and acceptability of the end users. The best way to ensure this is for end users to make their own system purchasing decisions from pre-qualified high quality SSPs.
- For each off-grid energy system, it is vital to have an entire hardware plus “software” implementation package. Such packages must consist of the technology, economics, financing, management, training, institutions, etc. necessary for the dissemination of that system.

D.2 Barriers to Implementation

- However well-crafted the off-grid energy strategies, they will not succeed unless the barriers that they face are identified and specific policies designed to overcome them. There is a market subset of barriers to new, rural energy options. In a study done in 2015 in which a 6,000-household survey was commissioned, the following barriers of adoption for off-grid solar devices in Pakistan were identified: ⁸ products were expensive, poor quality, weak supply chain and distribution, no after-sales service. A graphical presentation is below:



⁸ Pakistan Off-Grid Lighting Consumer Perception Study, IFC, 2015

D.3 Institutional Issues

Institutional Challenges

The key parameters stated above for implementation of off-grid energy strategies require public sector institutional support, financial support mechanism, creation of energy enterprise(s), encouraging financial institutions/banks/donors to participate and establishing conducive market mechanisms through active participation by the technology/solution providers/suppliers. A few institutional challenges that are imperative to address for deployment of off-grid energy solutions are as follows:

- Loans for purchase of energy efficient and off-grid devices (stoves, lamps, drives, boilers/furnaces/kilns, etc.)
- Marketing and public awareness raising of devices
- Leasing/Financing/Grants for devices so that unacceptably high first costs become acceptable
- Establishment and development of micro-entrepreneurs working in SHS space (particularly those run by women)

Institutional issues are important for rural energy development in general and for the promotion of SHS. It is important that micro-finance institutions and/or private-sector off-grid energy service companies at the community or regional-level are involved in providing off-grid devices to consumers, to address the affordability, quality and after-sales issues highlighted above. Quality is a major concern for consumers as well as financiers, and it is important that these issues are addressed.

Practical measures may include market assessments (ensuring that the potential market is more clearly understood), quality checks (quality standards should be set), grants (hence reducing the initial investment required), risk guarantees (this may only be partial to reduce long-term financial risk), and partnerships between government entities and suppliers, and micro-finance institutions and suppliers should be established for effective work on the ground.

D.4 Frameworks

Regulation

Regulation considerations for off-grid solar home systems need to be approached differently from grid connection/extension. Key approaches are detailed below, and are largely based international best practices:

- Adopt light handed and simplified regulation -- particularly procedures and processes for off-grid electrification. Establish an enabling regulatory framework that has clear separation of responsibilities. A clear separation of responsibilities requires that separate departments have distinct responsibilities for (a) planning, monitoring, policy setting, licensing and permits, (b) establishing/promulgating regulations, (c) compliance ("regulator"), and (d) conflict resolution, arbitration, and adjudication in cases where an involved party wishes to appeal a finding of the regulator.
- The regulator should temporarily or permanently "contract out" or delegate regulatory tasks to other government and non-government entities. One option can be regulator delegating regulatory tasks to AEDB/AEDF that inevitably is the defacto regulator because AEDB is more knowledgeable about the operations of electrification providers and is better able to weigh the costs and benefits of imposing regulatory requirements.
- Quality of service standards must be realistic, affordable, easily monitored and enforced. It is counterproductive to try to impose quality of service standards that cannot be met, although this does not imply that quality of service should be ignored.

- Legal rights and a level playing field for private sector participation: government regulations should permit private sector participants to enter the market for supply of electricity and ensure fair competition for all suppliers with respect to the traditional utility in competing for new customers.

Grants Scheme for SHS

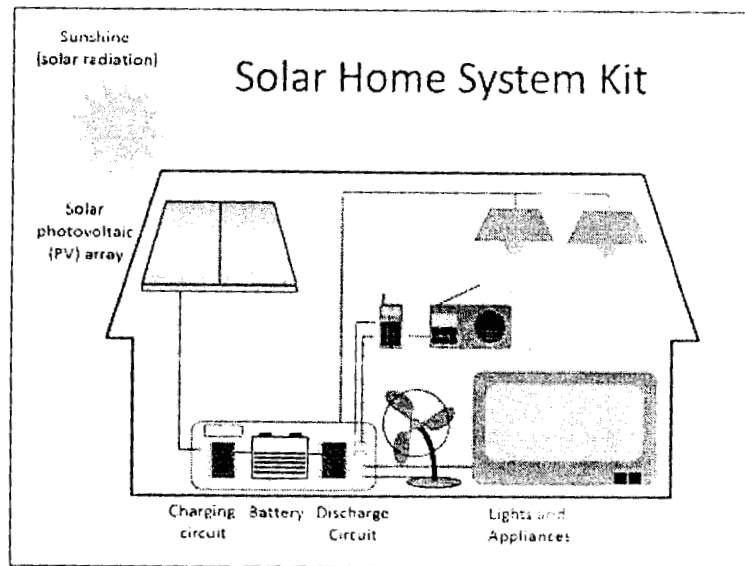
Under the Sindh Solar Energy Project (Component 3), Government of Sindh will provide an enabling environment by providing grants to SSPs to install SHS in targeted areas. The program will be taking a private sector approach to the development of the off-grid SHS market in Sindh, in line with the guidance provided by AEDB and many development partners. SSPs will be prequalified against objective criteria before being allowed to participate in the competitive bidding process to obtain the right to service prioritized areas and obtain partial grants for SHS sales made within those areas. Stringent technical criteria for product/system quality will be applied, including adherence to the relevant international standards and testing procedures. Spot inspections and product testing will be used to ensure compliance.

E. Goal and Objectives of Electrifying Households in Sindh

The goal for promotion and development of off-grid renewable energy options through SSEP is linked with sustainable development and contribution towards addressing energy crises. The mechanisms that would evolve from this goal should target economic growth that is economically efficient, need-oriented and equitable, self-reliant and empowering, and environmentally sound. Besides addressing energy shortages, the off-grid energy supply options should be reliable, safe, high quality and affordable. Renewable energy supply options, given their level of development, modular in nature, cost effective, reliable and clean in nature are the best suited options for this purpose. The basic objective of the SSEP is to provide each of the target villages with sustainable electricity options.

F. Solar Home System: A Solution for Rural Electrification

The SHSs provide generation at the point of consumption (e.g. a single building in an off-grid location). This solution often consists of battery based renewable energy systems. Hence, unlike full on-grid based systems a standalone system consists of several components all working together to create, store, and deliver energy for the electric demand. While standalone systems are ideal in cases of a single consumer, they can offer the most economical solution for rural electrification. For example, Pico solar home lighting kits may consist of a 20 to 150 Watt-peak (Wp) solar panel, battery bank, a charge controller and a set of LED lights, along with a fan: each LED light is designed to provide 3-5 hours of lighting a day. The system design caters for placement of solar panels in the form of an array on the rooftop or in open un-shaded areas in each house. The panels will charge batteries during daylight hours and the stored energy will be used to provide light to homes/streets and operate fans up-to 8 hours a day.



Under the SHS program, the following system configurations will be a part of the scheme:

The SHS kit (the "Product") shall meet the following **technical requirements**:

1. The Product shall include all components required to provide the required energy services and be sold/installed as a kit:
 1. PV module(s)
 2. Charge control unit(s)
 3. Battery/batteries
 4. Cables, switches, connectors, and protective devices sufficient to connect the PV module(s), charge control unit(s) and battery/batteries
 5. Loads / Appliances[1]
 1. Lighting
 2. Fan
 3. Mobile phone charging
 6. Requisite cables and adaptors for connecting all included loads and appliances
2. The Product and all included appliances shall be direct current (DC) only.
3. The Product shall be plug-and-play. No technicians or electricians are necessary to safely and successfully install and operate the system. All electrical connections can be made without the use of tools. Installation and operation instructions should be presented using language and graphics that can be understood by the typical consumer.
4. The Product shall meet or exceed the daily performance requirements described below.
5. Eligible products should be tested according to IEC TS 62257-9-5 at a laboratory that is ISO 17025 accredited for IEC TS 62257-9-5. Vendors shall provide an official test report showing that the product meets or exceeds the quality requirements outlined in the attached document."

The minimum **output requirement** for the 'starter' or 'basic' SHS will be 3 lights, one fan and one mobile charging option. Minimum **performance requirements** for stand-alone rechargeable solar home system kit:

	Specification	Remarks
Lighting	System capable of providing at least 1200 lumen-hours per day of lighting service (when used in combination with other required loads)	Daily energy services calculated based on daily solar insolation of 5 kWh/m ²
Oscillating DC fan	System capable of powering the fan for at least 8 hours per day (when used in combination with other required loads)	
Mobile Phone Charging	System capable of charging at least one smartphone (5.7 Wh) per day (when used in combination with other required loads)	

Households will be free to select larger or more sophisticated SHS from qualified SSPs, while receiving the same level of grant, if they so choose. Such systems would be required to meet the same technical standards, but would have higher output and performance standards than the basic/starter SHS. As a result, the grant scheme is fair to all households, with a higher proportion of grant (as a percentage of total SHS cost) available to poorer households. This also supports the simple and effective running of the grant scheme.

F.1 Photovoltaic Array

A PV array is a combination of a number of PV cells joined together to produce an electric current. The working principle behind this is, when sunlight falls on the PV cells we see that electrons break free from the atoms and move in a certain direction, the movement of these electrons produces electric current. For a PV array its performance is rated according to the current it produces in Standard Testing Conditions.

F.2 Charge Controller

The basic purpose of a charge controller is to prevent the batteries from overcharging by keeping a check on the voltage or the current. It regulates the voltage and the current coming from the PV array going into the batteries, preventing the batteries from overcharging and damage.

F.3 Batteries

These provide the storage option for the power generated by the array, the stored power can be used during the times when there is no sunlight falling on the array. There a different number of batteries, and battery size is chosen depending on system size and requirement.

G. Location of the Project

Under the scope of SSEP, the program is going to be undertaken in whole of Sindh. For identifying potential areas, a detailed study was carried out by the International Finance Corporation (IFC) that has helped inform this feasibility study. In this study geospatial methods and high-resolution nighttime

satellite imagery are used to identify unelectrified communities across Sindh Province in Pakistan. Building upon an approach that has been demonstrated to reliably detect electrified and unelectrified communities during previous research, the study uses geospatial techniques to analyze a lengthy time-series of nighttime satellite imagery to detect the presence, absence, and variability of outdoor lighting in rural communities across Sindh Province. This study is the basis for delivering off-grid solar solutions to the identified low energy access areas with solar home solutions to combat the energy access problem across Pakistan.

According to census 2017 figures released by Pakistan Bureau of Statistics division, the total number of households in Sindh was 8,585,610.⁹ NEPRA in 2016, reported a total number of domestic connections of 3,174,116 in Sindh.¹⁰ This translates into an electricity access rate of 37% for Sindh, with roughly 5,411,494 households without electricity connections.

Government of Pakistan
Ministry of Statistics
Statistics Division
Pakistan Bureau of Statistics

PRESS RELEASE ON PROVISIONAL SUMMARY RESULTS OF 6TH POPULATION AND HOUSING CENSUS- 2017

The provisional summary results of the 6th Population & Housing Census were presented to the CCI today. The CCI took note of the position and after detailed discussion allowed the Ministry of Statistics to disseminate the provisional results and directed the PBS to expedite the compilation of the final results.

PROVISIONAL SUMMARY RESULTS OF CENSUS-2017

2. The provisional results show the total population of Pakistan as 207 774 million, with an average annual growth rate of 2.4% over a period of 1998-2017.

3. The provisional province / area and sex wise population is given as under:-

CENSUS - 2017 PAKISTAN								
ADMINISTRATIVE UNITS	HOUSEHOLDS	MALE	FEMALE	TRANS-GENDER	TOTAL POPULATION	POPULATION 1998	SEX RATIO 2017	1998-2017 AVERAGE ANNUAL GROWTH RATE
1	2	3	4	5	6	7	8	9
PAKISTAN*	32,296,111	106,448,322	101,314,780	10,418	207,774,520	132,362,379	106.97	2.40
RURAL	20,612,767	67,500,174	64,484,505	2,767	132,166,513	86,655,233	103.77	2.23
URBAN	12,102,514	39,149,151	36,428,167	7,651	75,584,969	45,497,048	107.47	2.70
HYDERABAD	3,846,188	12,447,848	12,056,813	813	24,505,374	17,143,844	103.74	2.85
RURAL	3,104,184	10,436,278	10,209,036	229	20,645,543	14,456,435	101.80	2.87
URBAN	741,014	2,011,570	1,847,777	684	3,859,931	2,687,409	107.93	2.90
DATA	666,378	2,336,392	2,248,367	27	4,590,876	3,174,331	106.84	2.41
RURAL	547,256	2,481,840	2,377,611	27	4,859,724	3,360,806	103.57	2.41
URBAN	119,124	854,552	870,756	—	1,725,308	813,525	107.99	2.70
PUNJAB	17,102,836	56,968,874	54,048,188	6,708	111,023,442	73,627,280	103.84	2.13
RURAL	10,114,102	33,197,980	31,425,020	2,124	64,625,144	41,400,094	102.70	1.81
URBAN	6,988,734	23,770,894	22,623,168	4,584	46,394,298	32,227,186	106.91	2.74
SINDH	8,585,610	28,927,048	27,994,478	2,827	47,896,081	30,438,893	106.46	2.41
RURAL	4,185,628	14,119,106	13,056,183	501	27,175,890	17,444,446	107.80	2.96
URBAN	4,399,982	14,807,942	14,938,295	2,326	29,748,459	13,000,447	106.51	2.46
BALUCHISTAN	1,775,837	6,463,663	6,360,848	109	12,824,620	8,882,888	110.23	3.37
RURAL	1,301,414	4,590,099	4,478,193	40	9,068,332	6,167,085	110.27	3.37
URBAN	474,423	1,873,564	1,882,655	69	3,755,876	2,715,803	111.59	3.49
ISL	336,182	1,085,712	960,727	133	2,006,572	804,238	111.04	4.81
RURAL	185,246	515,856	475,840	52	991,747	376,055	106.41	6.95
URBAN	150,936	569,856	484,887	81	1,014,825	428,183	111.56	5.44

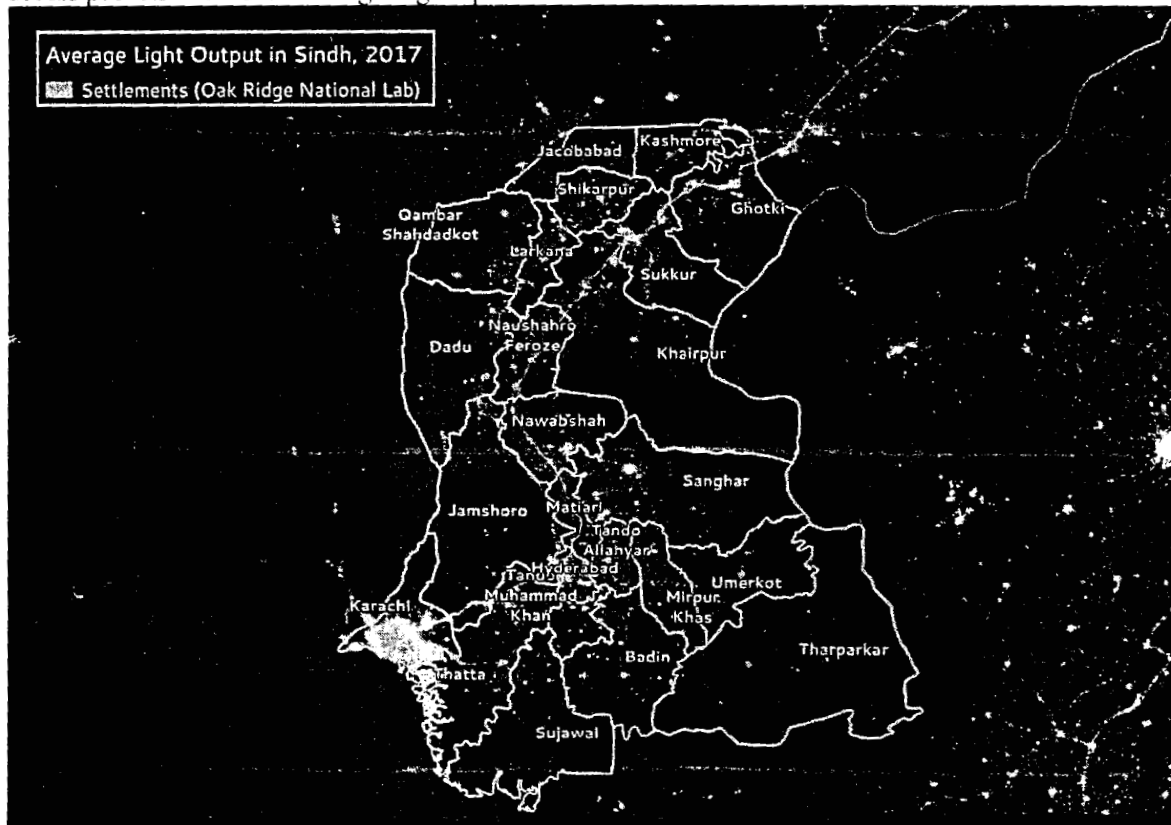
It has been challenging to locate these households, as they are scattered in various pockets across Sindh. Currently, national level estimates and survey-based studies do not provide the precise level of geographic detail to enable the government to efficiently target their increase in energy access efforts.

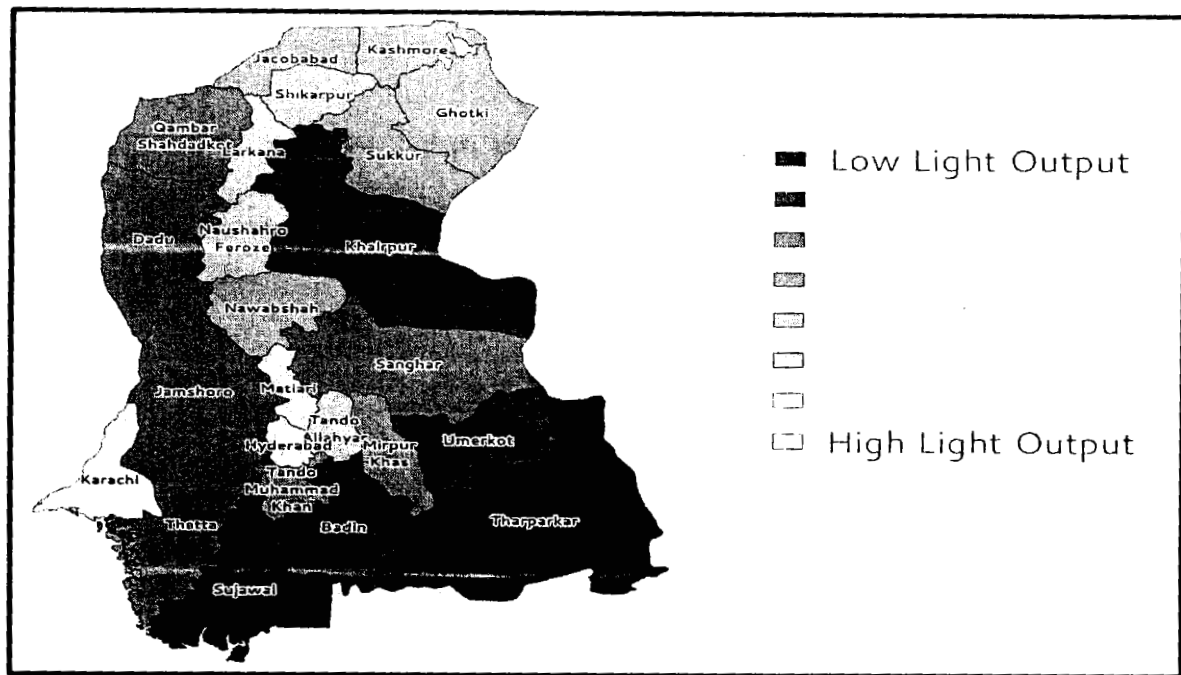
⁹ Annexure

¹⁰ NEPRA State of Industry Report, 2016

Acknowledging this problem, in November 2017, a study was launched by the IFC Lighting Pakistan program, where it hired an external specialist firm, Brian Min, to identify low energy access areas in Sindh and Punjab. Dr. Brian Min's team has been working to use nighttime satellite imagery to track and monitor energy access for nearly a decade and he is the author of a book on the topic as well as articles in peer-reviewed journals (Min 2015; Baskaran, Min, and Uppal 2015, Min and Golden 2013). The goal of the study is to assist stakeholders to better target their resources in delivering off-grid solar solutions to combat the energy access problem across Pakistan.

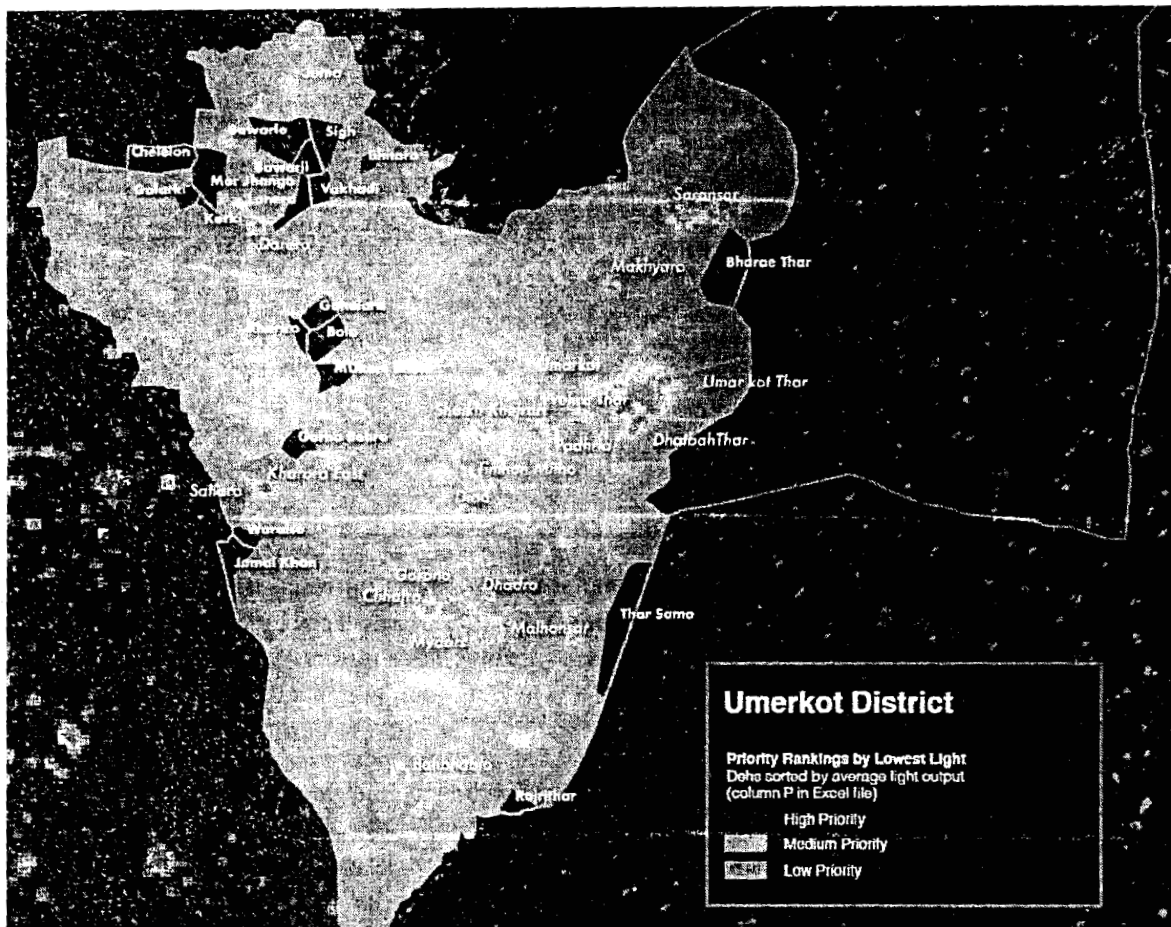
Satellite imagery of nighttime lights provide a unique perspective on the distribution and location of the world's electrified settlements. Since 1970, satellites from the U.S. Air Force Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS) have captured images of the earth at night from an altitude of 830 kilometers. These images reveal concentrations of ground-based lighting at a fine resolution of 0.56 km. On-board averaging of 5 by 5 blocks of fine data produces "smoothed" data with a nominal spatial resolution of 2.7 km. Technically, the low-light sensing capabilities of the OLS permit the detection of radiances down to 10^{-9} W/cm²/sr/μm (Elvidge et al. 2007). Prior studies have demonstrated that the DMSP-OLS satellites are able to detect bright lights originating from cities, fires, gas flares, and heavily lit fishing boats (Croft 1978, Elvidge et al. 1997b). Several studies have also shown that nighttime light output strongly correlates with economic activity at the regional and national levels (Elvidge et al. 1997b, De Souza Filho 2004, Doll et al. 2006, Sutton et al. 2007, Kiran Chand et al. 2009, Ghosh et al. 2010, Henderson et al. 2012). Currently work is on-going to identify low-energy access pockets in Sindh. The Lighting Map for the Sindh Province looks like:





The first map is a satellite image that captures night-lights over the Sindh province. It shows that urban areas are much brighter than rural areas of Sindh, where dark pockets of land can be seen, signaling the problem of low energy access in rural Sindh. The second map provides a further explanation in highlighting districts in terms of their light output, the low light to medium light output districts are likely the ones where villages with low energy access exist.

The above maps are high-level district maps for Sindh based on light output from the satellite images; however, the project is on-going and the study aims to identify high priority Dehs/villages within these districts, as that level of detail is required for effective interventions by various stakeholders. As of now, the work for two districts in Sindh, i.e. Jacobabad and Umerkot has been completed and the work for additional districts in Sindh will be completed by July 2018. The sample Deh/village level maps for Jacobabad and Umerkot are as follows:



The high priority Deh's are the ones that have the lowest light output and will be the likely target under the Project. The low priority Deh's are the ones where there is a high light output and should not be targeted under this scheme. The pink dots show the settlements data, i.e. where the population is present. The above map provides information on light output as well as population density in the Umerkot district of Sindh. A similar map for the Jacobabad district has been completed under this study:

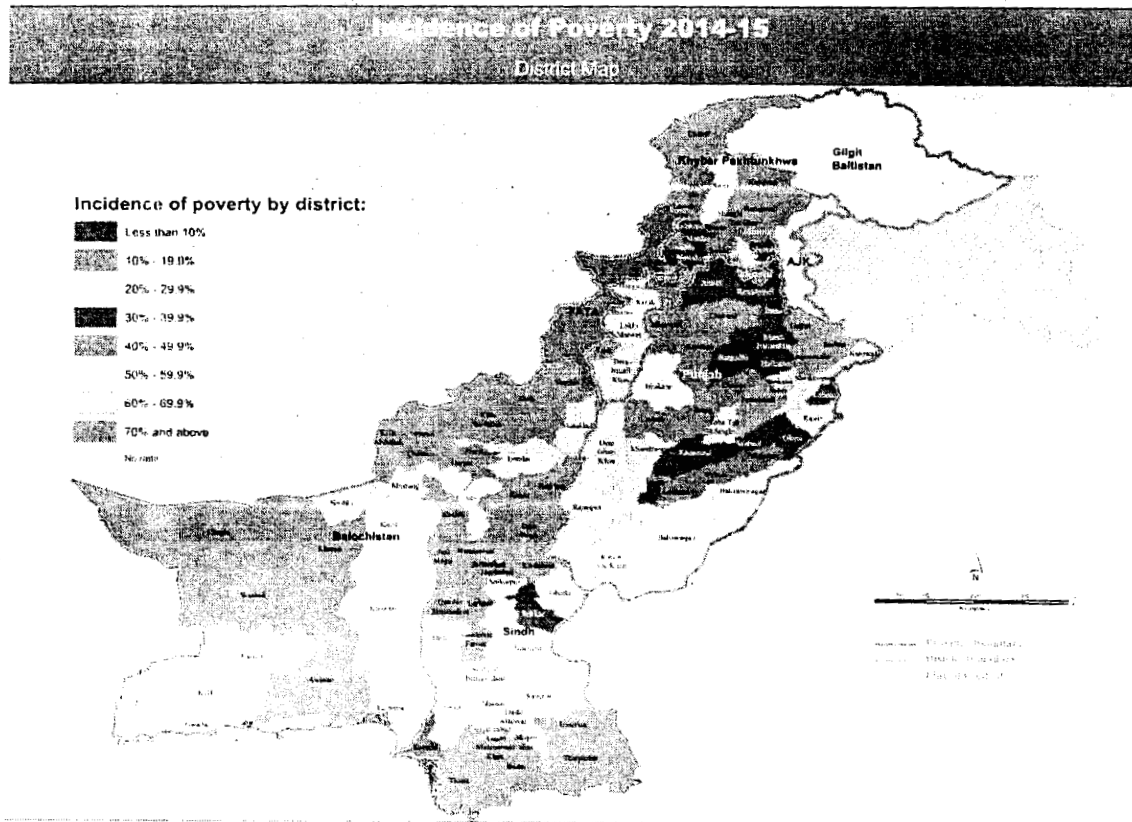
Jacobabad District

Priority Rankings by Lowest Light
Dehs sorted by average light output
(column P in Excel file)

- High Priority
- Medium Priority
- Low Priority



The UNDP Poverty Map for Pakistan is depicted as follows¹¹:



Based on the poverty map and the Lighting Map for Sindh, the most likely districts to be targeted are:

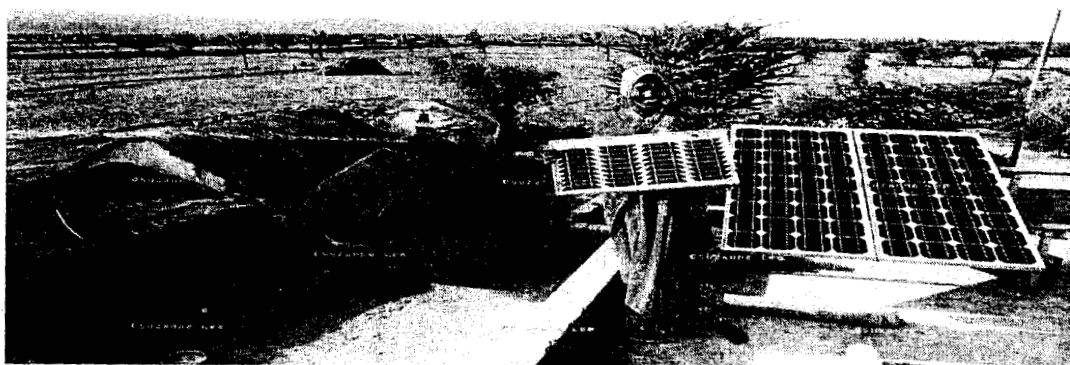
1. Sajawal,
2. Badin.
3. Tharparkar,
4. Umerkot,
5. Khairpur,
6. Sanghar,
7. Ghotki,
8. Kashmore,
9. Jacobabad,
10. Qambar Shahdadkot

As the Project is based on a 'framework' approach, and will be benefit from a household energy survey carried out at the start of implementation under Component 4 of the Project, the precise targeting will be further developed during implementation.

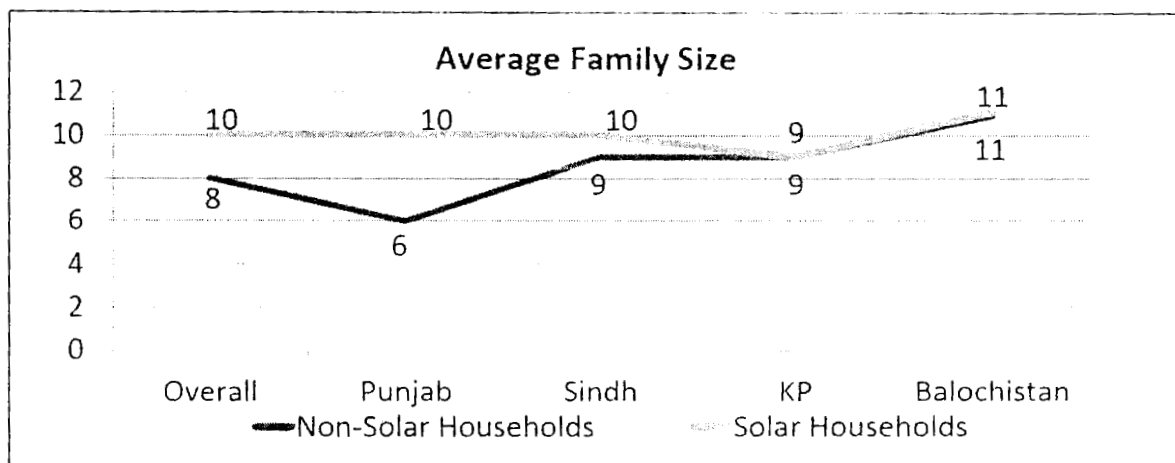
¹¹ http://www.pk.undp.org/content/pakistan/en/home/library/hiv_aids/Multidimensional-Poverty-in-Pakistan.html

H. Off-Grid RE Applications Promotion Mechanism

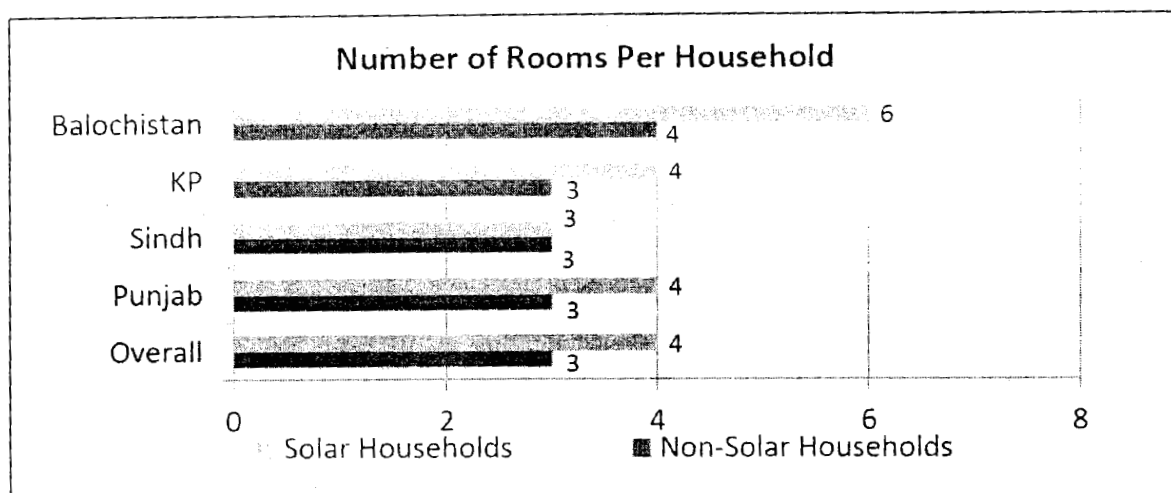
In order to promote Off-grid RE applications, a joint holistic effort is required. This mechanism needs to evolve through addressing barriers and implementing key parameters stated above. Under the proposed mechanisms, following off-grid RE applications shall be promoted:



According to a survey report it was observed that in rural Sindh the average room size is 3 and approximately 9 people per household.¹² SHS sizes between 50-150 Watt can suffice their electricity requirements. Each SHS consists of one solar PV panel, one battery, one charge controller, rechargeable fan and two to three LRD bulbs along with complete wiring. The accessories like PV solar panel mounting structure, switches and fuses, cable and wire will be the part of the system. As per requirement of community mobile phone charger is included as part of the system.



¹² Pakistan Off-Grid Lighting Consumer Perception Study, IFC, 2015



H1. Sustainability of the Private Sector Approach

As discussed previously, research shows that the number one barrier in adoption of SHS in Pakistan is affordability, followed by weak supply chain, quality of products and lack of after sales service. The SHS program in Sindh aims to tackle all the above barriers. It is addressing the affordability barrier by providing a grant amount where required, it is encouraging suppliers to develop a supply chain in rural areas where previously they may not be present, by providing them relevant data and reducing the cost of the systems for the consumers to afford the products. The PMU will ensure that the products being sold under this scheme follow a set quality standard (which will reduce O&M requirements), and that suppliers adhere to the requirement of providing after sales service. Moreover, this program will also invest in public awareness programs that will aim to change the consumer perception about the technology of SHS and provide awareness about this scheme and how it can benefit them.

According to a survey conducted¹³, an average off-grid household in Sindh spends PKR 1,135 per month on lighting and mobile phone charging needs. This does not include the expenditure on fans, other appliances etc.

	Average Monthly Expenditure on Lighting	Average Monthly Expenditure on Phone Charging	Total
Overall	889	400	1,289
Punjab	1,005	240	1,245
Sindh	485	650	1,135
KPK	639	150	789
Balochistan	1,594	600	2,194

If a PKR 30,000 system is installed that can power 3 lights, a fan, and a mobile charging option, we are looking at a pay-back period of 26 months, i.e. roughly a little more than 2 years. With a grant amount involved, the payback period will further drop (with a 20% grant, the pay-back period of the SHS drops to

¹³ Pakistan Off-Grid Lighting Consumer Perception Study, IFC, 2015

21 months). It is a matter of switching the consumers to a cleaner and better technology by changing their existing patterns of spending on alternate lighting and mobile phone charging arrangements to SHS. Over time as prices of SHS continue to drop, and technology becomes more advance, the consumers can upgrade to more advance systems. Moreover, the suppliers will be providing financing for covering the remaining cost of the SHS other than the grant amount, they may do this from their own finances or partner with private sector financing institutions. By the end of the 5 year program, an eco-system of suppliers, financiers, consumers, that are working with SHS will be created, and the market will progress to develop on its own in a sustainable manner.

I. IMPLEMENTATION METHODOLOGY / MECHANISM:

To promote Off-grid RE applications, a joint holistic effort is required. This mechanism needs to evolve through addressing barriers and implementing key parameters stated above. The implementation will be undertaken through a Program Management Unit (PMU). The activities undertaken in this regard will include the following:

To ensure sustainability of the systems, following steps will be undertaken while executing the project:

- Mobilization of beneficiaries through consumer awareness campaigns would be done for success of promoting installation of solar home systems in remote locations
- Training for installers, people involved in O&M services, on the ground sales people, for establishing supply chain mechanism will be ensured
- Effective Coordination with provincial government departments and suppliers will be ensured

For this project, it is planned that 200,000 households will be provided basic energy access services via Solar Homes Systems in different parts of Sindh Province. The Sindh Energy Department (SED) will identify number of households in each village that will be targeted for deployment of SHS's by SSP's. SSPs will be prequalified against objective criteria before being allowed to participate in the competitive bidding process to obtain the right to service prioritized areas and obtain partial grants for SHS sales made within those areas. The SSP will be responsible for recovering the amount other than the grant from the consumer. Upon successful completion of the installation, the installers will approach SED for grant of Result Based Funding (RBF) as a rebate. The amount of RBF grant will depend upon the remoteness level of the village.

During the implementation phase, SED will develop the overall grant mechanism that will indicate the proportion of the RBF grant that will be provided to the SSPs. The mechanism will be developed based on capacity of the villagers to contribute. If the villagers will have enough capacity that they can afford the cost of the solar home system, the SSPs will not be provided any RBF grant. However, the areas where the people are poor and they cannot afford the cost of the system, RBF grant will fund up to 40% of the total cost, remaining will be collected by the beneficiary.

I.1 Program Implementation Steps:

Provision of SHS will be done following below stated steps:

Step-1: PMU will hire a firm to conduct a household energy survey under Component 4, and will combine that data with census and other data available (e.g. IFC data).

Step-2: PMU will identify number of households to be targeted per area based on data generated, and decide on precise grant amount based on location.

Step-3: PMU will invite applications from SSPs for each area for basic level SHS installation which is described in this document.

Step-4: PMU will hire a firm to start a consumer awareness campaign in the targeted areas, and will provide training to on-the-ground personnel involved in SHS deployment.

Step-5: PMU will award bids for their respective locations based on the lowest bid received for the basic system, and will identify consumers in those areas.

Step-6: For every installed SHS, the SSP that won the bid, will claim the grant from the PMU. Other SSPs that did not win the bid will be free to compete in the area, but will not be provided an RBF grant.

Step-7: M&E activities will be conducted by SED to monitor the activities of the project, compliance by SSPs, and to take corrective measures in case of complaints.

1.2 Participatory Requirements of the Program

Public Awareness Programs

Solar Home Systems will have positive impact over the living standards of the beneficiaries are the end users who will be provided with the electricity for lighting purposes. To ensure the success of the project, it is essential to provide consumer awareness to beneficiaries. A contracted firm will be hired to demonstrate to the beneficiaries' technology, its benefits, limitations and expectations.

There are many ways to raise awareness in public about SHS. Some of the ways are listed below:

1. Trade Kiosks
2. Brand Ambassadors
3. Branded Vans
4. Newspaper Advertisements
5. Radio Advertisements
6. Brochures & Leaflets
7. Community Visits
8. Street Theatre
9. Community Solar Mela
10. Mohalla Gatherings
11. Dhaba Gatherings
12. Demonstration Bike Caravan

Some of the activities are explained below:

Brand Ambassadors (BAs)

- Brand Ambassadors are staff that are trained to sell solar home systems
- They impart knowledge to consumers about the features and benefits of solar home systems
- They demonstrate the usage of solar home systems first hand to beneficiaries, so that the message of the benefit of switching to this technology is made clear

Trade Kiosks:

- Prior permission shall be taken by shop/ trade via client
- 2 BAs with a branded Kiosk will be stationed as per provided itinerary by client for spot
- Setup will be installed in the permitted Stores:

Setup Includes:

1. 1 Kiosk
2. Display Products
3. Brochures

- BAs will be intercepting the target audience and educating them about the products
- Walk in customers will be experiencing the displayed products
- The BAs will be educating people about products and its benefits
- They will be encouraging the target audience for trials
- Product brochures will be given to every interception

Dhaba Gathering:

- Prior permission shall be taken at dhaba/restaurant in the area as per itinerary
- Setup will be installed in the permitted area to intercept audience:
Setup Includes:
 1. 1 Kiosk
 2. Display Products
 3. Buntings/Posters
 4. Brochures
- Before starting activity, team will brand the spot with buntings and posters
- In addition, for demonstration team will install solar panel lights in the dhaba to create hype and awareness
- They will distribute leaflets for brand information
- The Brand Ambassadors will educate the participants about products

Mohalla Gathering:

- A Hi-Ace Van will be moved carrying all the team members
- A Loading Van will be moved for Carrying setup
- Prior permission will be taken for working in a neighborhood for Arena setup
- A setup will be installed in the permitted location:
Setup Includes:
 1. Arena Setup (Stage, Backdrop, Chairs and Tent setup)
 2. 1 Kiosk
 3. Display Products
 4. 1 Sound System
 5. 1 LCD with Stand
 6. 1 Laptop
 7. 1 Generator
 8. Brochures
 9. Backdrop
- BAs will invite the target audience in the neighborhood to the permitted location
- A Gathering of around 20-30 persons will be gathered for each Demo and session
- The BAs will educate the participants about products

Demonstration Bike Caravans:

A Caravan with 03-04 bikes, will move from shops to other villages nearby wearing branded caps, hoodies and having bikes covers for branding purposes. This will happen for 03 days within the city in which we will cover maximum number of potential customers.

Street Theatre:

A firm that performs street theatre is employed and the script of the theatre is tailored towards awareness of solar home systems for household use and its benefits. The theatre acts as a means of community mobilisation and awareness.

Exhibition/Mela:

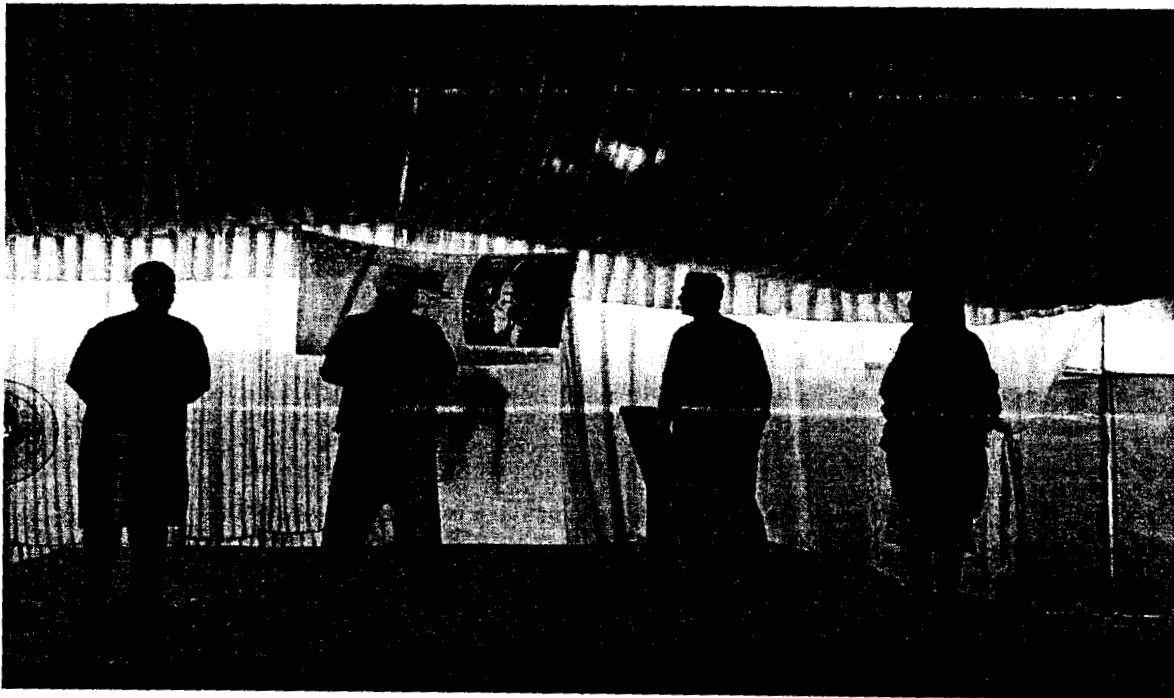
These melas are aimed at displaying the products through booths and stalls along with BAs demonstrating the solar home systems as a means of awareness. The booths contain different solar home systems that can be seen and experienced by customers first hand.

The indicative budgets per activity for some of the activities listed above are:

Item	Indicative Budget
Street Theatre	PKR 100,000
Exhibition/Mela	PKR 200,000
Brand Ambassador (per person per month)	PKR 20,000
Radio/Newspaper	PKR 400,000
Bike Caravans (for 10 days)	PKR 60,000
Branded Van (for 30 days)	PKR 100,000
Trade Kiosk (per unit)	PKR 18,000

Some of the pictures from the above activities are below:

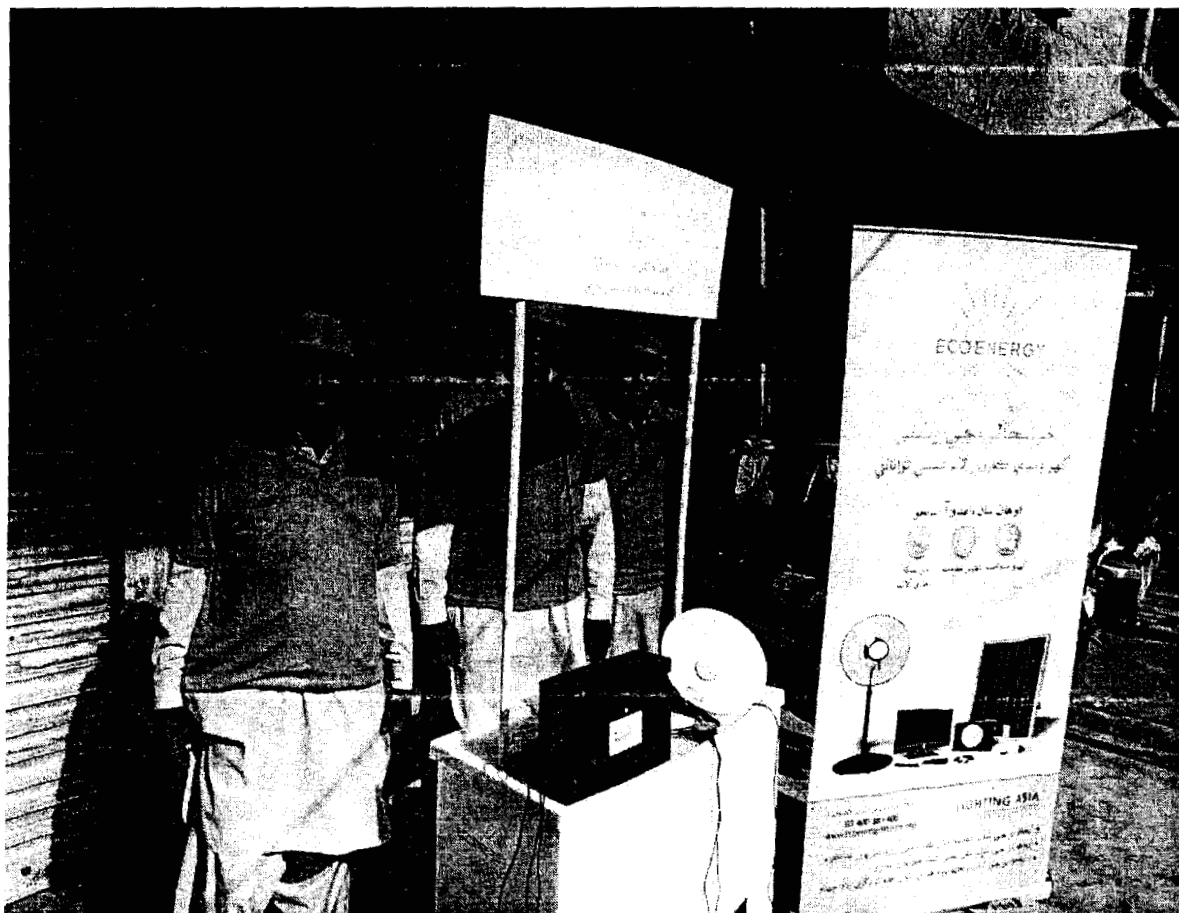
Street Theatre:



Street Theatre Audience:



Trade Kiosks:



Demonstration Bike Caravans:



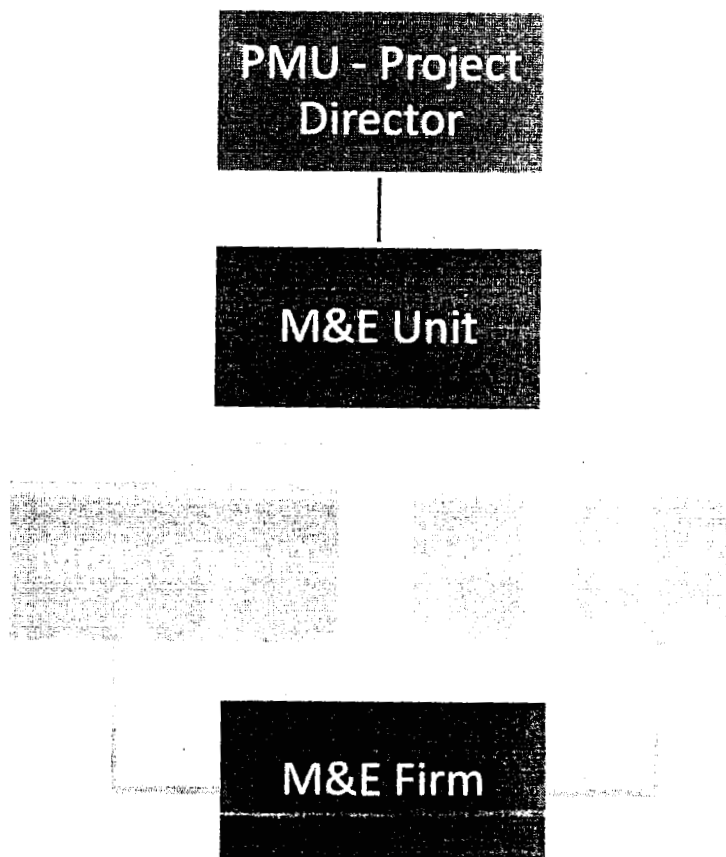
Branded Vans:



Monitoring and Quality Assurance

To ensure success of the project and confidence building of the community as solar home system is a new technology on such a magnitude in remote area, it is necessary to have continuous monitoring and evaluation during execution and completion of the project by PMU. Strict quality testing standards for SHS will be adopted. Random sampling of SHS of qualified vendors will be done and sent to laboratories for testing, and if found below the minimum standards, that SSP will be disqualified. Also, a consumer helpline will be established to answer and follow up on consumer complaints. During implementation phase, the emphasis will be on active end users' participation, quality of the systems and role of users in adhering to the described use of the system. These are crucial factors in the success of project. The monitoring will also highlight the issues like as to what has been intended and what has been achieved, if not, the remedial strategy for their removal, obstacles in implementation, flaws of coordination implementation gaps etc.

Staffing of M&E Unit at the PMU: The PMU will include M&E staff/consultants, and mechanisms will be incorporated into Component 3 to provide real-time tracking of results. Data and statistics on actual project outputs and outcomes will be gathered, analyzed, and included in the quarterly progress reports to be submitted to the WB. The structure of the M&E Unit within the PMU will look like:



Activities Conducted Under the M&E Unit:

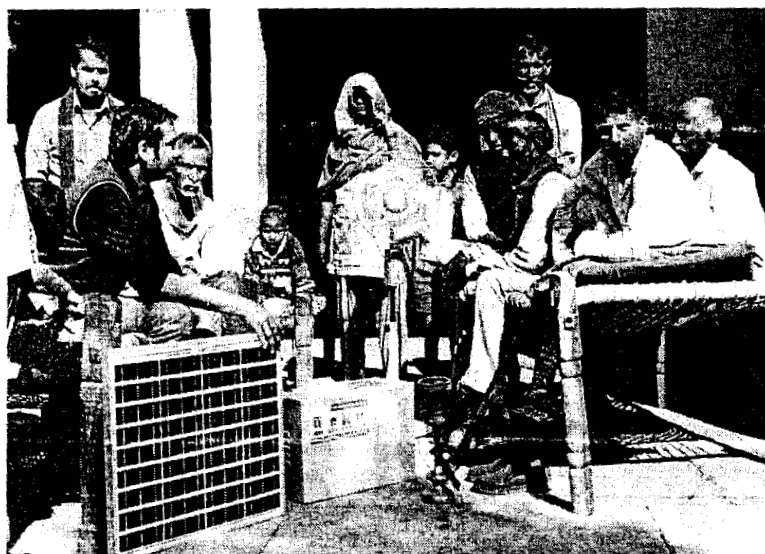
A household energy survey will be commissioned under Component 4 to provide baseline values for M&E. The survey will be carried out at the start and end of the Project, and will conform to the Multi-Tier Framework (MTF) approach for assessing access to electricity,¹⁴ including gender disaggregation. The M&E firm will be hired to collect data on the ground during project implementation, and will be overseen by M&E Officers hired under PMU's M&E Unit. The M&E Firm will collect the following kinds of data:

- Number of consumers reached because of the public awareness campaign
- Number of staff trained under the capacity building program
- Number of households provided energy access
- Performance of SHS provided to beneficiaries
- O&M Performance of SSPs

¹⁴ The Multi-Tier Framework for Energy Access is a global standard for assessing and reporting energy access. See World Bank. 2015. "Beyond Connections: Energy Access Redefined." <https://openknowledge.worldbank.org/handle/10986/24368>.

- Complaints and Issues identified by beneficiaries
- Random sample checks of SHS by qualified SSPs

Please note that the above data collection will be the responsibility of the PMU at different levels of frequency depending on the indicator, however **the M&E firm will act as an independent third-party verifier of the collected data.** The M&E firm will report the data to the M&E officers, who will then work with other officers in the PMU that are responsible for data collection of the program, and work with them to see if the data is in line with what is being reported, or there are discrepancies. In case of any major discrepancies, the M&E officers will work with the project steering committee to identify solutions to the problem.



Target Villages under the SHS Program

The program aims to impact 1.2 million people in Sindh, with a target of 200,000 solar-home-systems installed. The criteria for target villages is (i) those with a high number of villages without grid-provided electricity (no nearby transformer/distribution network); (ii) those with a high number of villages with grid-provided electricity but with low levels of reported electricity access.

J. TIMELINES OF THE PROJECT:

No	Activity	Deliverable	Timeline (years)
1	Phase I	Technical Assistance: Data generation through survey, detailed program design	$T_0 = 1$
2	Phase II	i. Consumer Awareness	$T_1 = 4$
		ii. Training & Capacity Building	
		iii. Identification of Villages	
		iv. Selection of SSPs	
		v. Deployment of SHS in village households by SSPs	
		vi. RBF Grant Provided to SSPs	

	ii.	Monitoring & Evaluation Activities	
TOTAL TIME			5 years

K. TOTAL COST OF THE PROJECT:

The cost of the Component 3 is US \$ 30 million. This will suffice providing SHS to 200,000 households based on the projected level of grant support and the cost of the other parts of Project implementation. The amount of the grant per SHS will be dependent on the area where the SSP will provide its services. will be determined during the project.

The breakdown of the budget for Component 3 is provided below. This excludes the PMU staffing, and the cost of the household energy surveys carried out under Component 4 of the Project.

Item	Indicative Budget
Citizen awareness and engagement	\$3,225,000
Results-based grant Year 1 (3,000 HH)	\$437,500
Results-based grant Year 2 (17,000 HH)	\$2,187,500
Results-based grant Year 3 (40,000 HH)	\$5,000,000
Results-based grant Year 4 (60,000 HH)	\$7,500,000
Results-based grant Year 5 (80,000 HH)	\$10,000,000
Monitoring & evaluation (7,500 HH surveyed; 97% confidence)	\$ 262,500
Contingency	\$1,387,500
Total cost	\$30,000,000

MINUTES OF CDWP MEETING HELD ON 2.5.2018

MINUTES OF CDWP MEETING HELD ON 02-05-2018

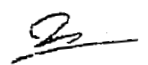
Item-4A: Sindh Solar Energy Project (SEEP)

(Total Cost Rs. 11,440.21 million including FEC of Rs. 6,545.00 million)

Chief (Energy) informed that the objective of the project is to support the scale-up of solar power in Sindh province and increase access to electricity. The scope of project consists of four components.

- i) Component-1 is Utility-Scale Solar which includes development of Solar Parks to support private sector investment and launching of Pakistan's first competitive bidding for solar power production, starting with an initial 50 MW pilot solar auction at a site near Manjhand, district Jamshoro.
- ii) Component-2 is Distributed Solar which includes at least 20 MW of distributed solar PV on the rooftops and other available space on and around public sector buildings (schools, hospitals, administrative buildings) in Karachi, Hyderabad, and in other districts of Sindh.
- iii) Component-3 is Solar Home Systems to at least 200,000 households in Sindh targeting areas with low or no electricity access in Sindh.
- iv) Component-4 is Capacity Building & Technical Assistance activities to support the design implementation of the program and to learn state of the art solar PV technologies in practice in developed countries for electricity access. This component supports to Energy Department, Government of Sindh and other relevant entities.

2. Member (Energy) informed the forum that we support the concept but there are some project design issues which were discussed in pre-CDWP meeting that put the sustainability of the project at risk. However, the compliance is awaited from the sponsors. Detailed feasibility study of the project including all components should be provided and an updated PC-I based on the feasibility needs to be furnished for rationalized and judicious spending of the proposed loan. All the relevant stakeholders including CPPA-G, NTDC, AEDB, Power Division and HESCO should be taken on board for evacuation of power from Component-1 (400 MW) of the proposed project. He further informed that the World Bank study being referred to for component-2 is not a feasibility study but a desk study, mainly identifying potential of solarization of selected public buildings in Karachi and Lahore. Technical design, layout, participatory appraisal, implementation framework and cost estimates etc for components 2 and 3 have not been provided and as such cannot be blankly supported in current form. For component-1, NTDC has not taken any responsibility for power evacuation. Since private sector investment has matured in Pakistan's RE Sector, World Bank loan should be used as a guarantee instead of commercial lending for both components 1 and 2. Component 3 should also be based on World Bank's Result Based Financing approach. The entire implementation mechanism needs to be designed very carefully to ensure sustainability of the project and successful implementation of RE Projects in Pakistan. If designed with due



consideration, the actual financing requirement for this project may reduce considerably. The detailed system design, list of villages which are off-grid, along with lesson learnt from previous projects, and plan layout is missing in the PC-I for component 2 i.e Distributed Solar.

3. To a query, Secretary Energy Department Sindh informed that project is proposed on feasibility studies carried out for solar dissemination. 50 MW Solar excluding grid interconnection study, which will be carried out in collaboration with HESCO. Sindh Energy Department is proposing a framework approach for this Project, considering its large size in terms of financing, and the five-year implementation period. This is very standard for other projects financed by multilateral development banks. demand for distributed renewable energy generation in Pakistan carried out in June, 16 by the World Bank Group. Internal feasibility for solar home systems has been carried out by Sindh Energy Department.

4. Representative from EAD informed that World Bank is very much interested in providing loan for this project but loan should be in line with national policy and national interest. Hence, concluded with the condition of feasibility the project can be supported.

5. The Chair confirmed that since loan liability and repayment will be the responsibility of Govt. of Sindh hence the Sponsor should carefully consider the viability of the project.

Decision

6. The CDWP constituted a Committee under Member (Energy) to address the highlighted issues of power evacuation, project design and feasibility studies. The Committee will present its recommendation after stakeholders' consultation before submission of Summary to ECNEC.


MUSHTAQ AHMED RAJA
Chief (PIA)

MINUTES OF REVIEW COMMITTEE MEETING HELD ON 24.5.2018

Government of Pakistan
Ministry of Planning, Development & Reform
(ENERGY WING)

MINUTES OF THE REVIEW MEETING HELD ON 15.05.2018

~~Subject: Sindh Solar Energy Project (SSEP)~~

A review meeting was held on 15.5.2018 under the chairmanship of Member (Energy) at 02:00 pm in Conference Room, 5th Floor, Energy Wing, S&T Building, Islamabad to discuss the feasibility for evacuation from the subject project. The list of participants is attached.

1. Member(Energy) welcomed the participants and queried about implementation period, location, evacuation plan for 50 MW solar power plant at a site near Manjhand and timeline of installation of further 400 MW power plants. He further asked whether Sindh Transmission Dispatch Company option will be considered if there is denial from NTDC. Sponsor replied that 50 MW solar power plant is designed to put competitive bidding into practice through auction resulting in a new benchmark on both process and pricing and attracting private sector investment, including foreign direct investment (FDI). Moreover, the sponsors further informed that 50 MW competitive bidding will be in December 2018 and construction phase will be completed till December 2020 or first quarter of 2021 after first auction, studies will be conducted for 400 MW and by 2023, 400 MW power plants will be in operational phase. Sindh Transmission Dispatch Company option may be considered in case of denial from NTDC.

2. Representative from HESCO informed that 132kV HESCO's transmission system is part of the integrated transmission network, comprising 500/220kV system of NTDC. In case of any injection of power at any voltage level will impact the NTDC's system & the impact of this project will be on both transmission system networks / integrated transmission networks (NTDC's + HESCO's). Besides, NTDC being the main stake holder of integrated transmission network may be taken on board regarding safe dispersal of power from the said Project.

3. Representative from AEDB updated that in case the project bidding process is initiated by Dec, 2018, as informed by GoS representative, then the 50 MW project in Phase-1 can achieve COD by Q-1 / Q-2 of 2021 as per the typical timelines allowed under RE Policy and NEPRA's determinations. As far as the share of renewable energy is concerned, the guiding documents are the Grid Code Addendum 1 (for wind power projects) and Grid Code Addendum 2 (for solar power projects). The share of wind power is set at 5% of the installed power generation capacity whereas there is no cap on solar power projects as per the grid code and the projects are to be decided on case to case basis. The DISCOs and NTDC both review the Grid Interconnection Studies of power projects and all the parameters related to evacuation facilities and viability of power evacuation get analysed in the review Grid Interconnection Studies. The approval of Grid Interconnection Studies by NTDC is mandatory and this would become basis of inclusion of the project in the generation plan.

4. Representative from SEPCO informed that there are seven solar power plants of total 210 MW in SEPCO territory and grid interconnection studies are already being done for 5 solar power plants. Member (Energy) inquired that is it possible to induce more power solar power plants in SEPCO's system? He informed that if NTDC approves then it is possible.

5. Representative from CPPA-G informed about the decision of CCOE on competitive bidding and stated that proposed project may be included in the generation plan of NTDC.

Decisions

The stakeholders including HESCO, SEPCO, CPPA and AEDB reached consensus to support the project subject to compliance with the prevalent framework for approval of solar power projects in the country.

MINUTES OF 2ND MEETING OF CDWP HELD ON 24.5.2018

Government of Pakistan
Planning Commission
Ministry of Planning, Development and Reform

MINUTES OF CDWP MEETING HELD ON 24-5-2018

PP-2: Sindh Solar Energy Project (SEEP)

(Total Cost: Rs. 11,440.21 million including FEC of Rs. 6,545.00 million)

Chief (Energy) informed the forum that CDWP in its meeting held on 2nd May, 2018 constituted a Committee under Member (Energy) to address the highlighted issues of power evacuation, project design and feasibility studies. The Committee will present its recommendation after stakeholders' consultation before submission of Summary to ECNEC.

2. Member (Energy) informed that in compliance of the CDWP decision, a review meeting was held on 15th May, 2018 and the stakeholders including HIESCO, SEPCO, CPPA and AIDB reached consensus to support the project subject to compliance with the prevalent framework for approval of solar power projects in the country. The project is therefore supported as updated feasibility report regarding component 1, component 2 and component 3 has been submitted by Energy Department, Government of Sindh along with clarification of project implementation mechanism by World Bank. Moreover, World Bank has also assured that further financing of any of the investment/implementation activities would not be released unless the detailed design and fiduciary controls are in place.

3. The Chair observed that there is an allocation of Rs115.5 million for Third party monitoring, the sponsors were asked to explain the mechanism. The sponsors informed that a third party vendor will be hired to carry out operation and maintenance through a long term contract for the sustainability of the project.

Decision

The CDWP recommended the project at a total cost of Rs11,440.21 million including FEC of Rs6,545.00 million for consideration of the ECNEC.



MUSHTAQ AHMED RAJA
Chief (PIA)

for SC (2nd)
27/5/18
27/5/18

**MINUTES & DECISION OF EXECUTIVE COMMITTEE OF THE NATIONAL
ECONOMIC COUNCIL (ECNEC) HELD ON 14.11.2018**

MINUTES AND DECISIONS OF THE MEETING OF
EXECUTIVE COMMITTEE OF THE NATIONAL ECONOMIC COUNCIL (ECNEC)
HELD ON 14TH NOVEMBER, 2018

A meeting of the Executive Committee of the National Economic Council (ECNEC) was held on 14th November, 2018 in the Committee Room of the Cabinet Division, Islamabad. The Minister for Finance, Revenue and Economic Affairs presided over the meeting. The meeting commenced with recitation from the Holy Quran by Mr. Fazal Abbas Maken, Cabinet Secretary. Thereafter, the ECNEC took up the agenda.

Case No. ECNEC-42/6/2018
Dated: 14th November 2018

SINDH SOLAR ENERGY PROJECT (SSEP)

MINUTES

The Ministry of Planning, Development & Reform informed that objective of the project is to support the scale-up of solar power in Sindh Province and increase access to electricity. Moreover, the project will improve energy security, and fulfill Pakistan's International commitments on 'climate' change. The scope of project consists of the following four components:

- i. Utility-Scale Solar
- ii. Distributed Solar
- iii. Solar Home System (SHS)
- iv. Capacity Building and Technical Assistance

2. The Ministry of Planning, Development & Reform further informed that the CDWP in its meeting held on 02-05-2018 constituted a Committee under Member (Energy) to address the highlighted issues of power evacuation, project design and feasibility studies. The Committee was to present its recommendation after stakeholders' consultation before submission of summary to ECNEC. In compliance of CDWP decision, a review meeting was held on 15-5-2018 under Member (Energy) and it was decided that the stakeholders including HESCO, SEPCO, CPPA and AEDB reached consensus to support the project subject to compliance with the prevalent framework for approval of solar power projects in the country. An updated feasibility report regarding component-1, component-2 and component-3 has been submitted by Energy Department Government of Sindh along with clarification of project implementation mechanism by World Bank. The World Bank has indicated that financing of any of the investment/implementation activities would not be released unless the detailed design and

SECRET

fiduciary controls are in place. Accordingly, a position paper was submitted to CDWP on 24-5-2018 and CDWP recommended the project for consideration of ECNEC.

3. The Ministry of Planning, Development & Reform apprised that the project was again considered by the CDWP in its meeting held on 24-5-2018 and recommended for consideration of ECNEC at a total cost of Rs.11,440.21 million including FEC of Rs.5,545.00 million.

4. The Ministry of Planning, Development & Reform submitted the project for consideration of the ECNEC at an updated cost of Rs.12,848.11 million including FEC of Rs.7,952.90 million (1US\$ = Rs.124.08).

5. During the ensuing discussion, it was observed that FEC component of the project has been calculated at old exchange rate i.e. 1 US\$ = Rs.124.08. Now the exchange rate has changed significantly which will ultimately increase the cost of the project and for this purpose a fresh approval of the competent forum might be required according to current exchange rate. The meeting was informed that ECNEC in its earlier decision vide letter No.171/CF/84, dated 27th June, 1984 instructed all Ministries/Divisions that it will not be necessary to obtain fresh approval for ongoing schemes if the cost goes up only because of the fluctuation of exchange rate.

DECISION

The Executive Committee of the National Economic Council considered the summary dated 7th November, 2018 submitted by the Ministry of Planning, Development & Reform regarding the **Sindh Solar Energy Project (SSEP)** and approved the project at an updated cost of Rs.12,848.11 million including FEC of Rs.7,952.90 million (1US\$ = Rs.124.08). In view of the recent sharp adjustments in exchange rate, ECNEC directed Planning Commission to incorporate the updated cost in the case of each Project.

PROJECT JUSTIFICATION

As a result of sustained equipment and construction costs reductions internationally and the experience gained from several early projects, solar power is now a least-cost form of generation in Pakistan, alongside wind power. This offers the potential for Pakistan to reduce its average cost of generation, diversify away from imported fossil fuels, and realize the climate change, air pollution, and water conservation benefits of transitioning to renewable sources of electricity. However, to continue to drive down the cost of solar power Pakistan needs to fully implement competitive bidding through a stable, transparent, and predictable series of solar auctions, leveraging the successful experiences of other countries such as Mexico, UAE and South Africa. There is also a need for future solar and wind projects to be developed more strategically than in the past, taking account of land availability, grid capacity, and grid integration issues, which argues in favor of a stronger government role in identifying and pre-developing sites for private sector development of solar power plants.

ANNEXURE F

Pakistan has excellent solar and wind resource potential, but their capacity remains relatively low at 800 MW of wind and 400 MW of solar. In 2006, the Government of Pakistan released its Policy for Development of Renewable Energy Generation ("**2006 RE Policy**"). The 2006 RE Policy dealt with small hydropower (<50 MW), solar, and wind, and set out an initial plan for development of renewable energy within the country. However, progress has been slow and it has only been in the last seven years that investors' interest has gained momentum with wind development primarily in Sindh province, and solar photovoltaic ("**PV**") development primarily taking place in Punjab. Until 2016 NEPRA provided an "up-front tariff" for solar and wind power (equivalent to a feed-in tariff). The Alternative Energy Development Board ("**AEDB**") was established as an autonomous body with the aim of promoting and facilitating the exploitation of renewable energy projects in Pakistan. The provincial energy departments and AEDB are issuing a Letter of Intent ("**LOI**") to project sponsors, which was the first step in developing a renewable energy project. Under the 2006 RE Policy, once the developer has secured all requisite approvals in the development process and has signed an EPA with CPPA-G, K-Electric, or another DISCO, it is mandatory for the distribution utility to purchase all of the electricity offered to them by the project. In 2017, NEPRA announced that future solar and wind projects would be awarded tariffs through competitive bidding¹. However, there is currently a backlog of around 4.5 GW of LOIs issued to project sponsors under the up-front tariff regime leading to uncertainties in the renewable energy sector on how and when future projects will be awarded.

¹ Future wind projects will use NEPRA's Benchmark Levelized Tariff as basis for complete bidding.

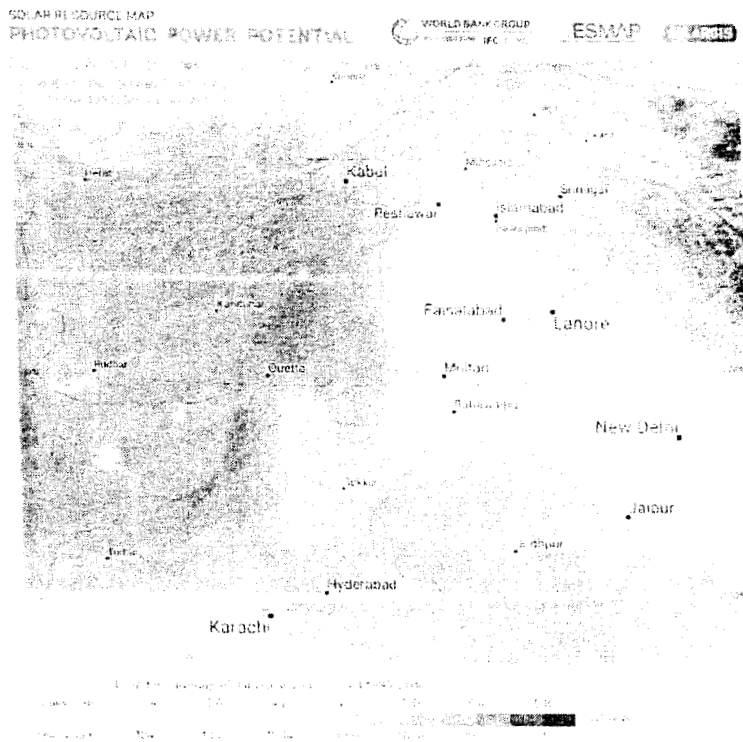


Figure 1: Solar PV power potential in Pakistan (Source: Global Solar Atlas)

Pre-feasibility and initial surveys have been conducted for each Component, and work is relatively advanced on Component 1. For the pilot solar auction at the 50 MW site, a Feasibility Study has been commissioned to assess the candidate project area and prepare the bidding package, including an ESMP. The proposed project site would be connected to a nearby substation and power would be connected to HESCO's grid at 132 kV in adherence to NEPRA's grid code regulations. For Component 2, in addition to meeting the relevant IEC technical standards for solar PV equipment and NEPRA's net metering regulations for interconnection at the distribution level, the component will adhere to international and local building code regulations in relation to rooftop static and dynamic loading requirements. SED will provide a portfolio of public sector buildings, which will be appropriately surveyed by the project. For Component 3, it is proved that for small house holds specially in rural areas where there is minimum energy requirement as compared to urban houses, it is appropriate to provided small solar home systems lighting few bulbs and a fan instead of extending the grid distribution line.

ANNEXURE G

YEAR WISE ESTIMATION & OPERATING COSTS OF PMU

SINDH SOLAR ENERGY PROJECT (APPROVED COST)

	Type of cost	Qty	Year 1 (2018 - 19)					Year 2 (2019 - 20)					Year 3 (2020-21)					Year 4 (2021-22)					Year 5 (2022-23)					Total (2018-23)	Total (2018-23) GoS Share	Total (2018-23) WB Share
			Unit cost/ Month	Months	Amount	GoS Share	WB Share	Unit cost/ Month	Months	Amount	GoS Share	WB Share	Unit cost/ Month	Months	Amount	GoS Share	WB Share	Unit cost/ Month	Months	Amount	GoS Share	WB Share	Unit cost/ Month	Months	Amount	GoS Share	WB Share			
Local Revenue Component																														
A Implementational & Operational Cost																														
1 Salaries of PMU Staff																														
1.1	Project Director PPS-10	1	250,000	12	3,000,000.00	3,000,000.00	-	262,500	12	3,150,000.00	3,150,000.00	-	275,000	12	3,300,000.00	3,300,000.00	-	287,500	12	3,450,000.00	3,450,000.00	-	300,000	12	3,600,000.00	3,600,000.00	-	16,500,000.00	16,500,000.00	-
1.2	Procurement Manager PPS-9	1	175,000	12	2,100,000.00	2,100,000.00	-	183,750	12	2,205,000.00	2,205,000.00	-	192,500	12	2,310,000.00	2,310,000.00	-	201,250	12	2,415,000.00	2,415,000.00	-	210,000	12	2,520,000.00	2,520,000.00	-	11,550,000.00	11,550,000.00	-
1.3	Accounting Officer PPS-9	1	125,000	12	1,500,000.00	1,500,000.00	-	131,250	12	1,575,000.00	1,575,000.00	-	137,500	12	1,650,000.00	1,650,000.00	-	143,750	12	1,725,000.00	1,725,000.00	-	150,000	12	1,800,000.00	1,800,000.00	-	8,250,000.00	8,250,000.00	-
1.4	Environment & Social Development Officer PPS-8	1	175,000	12	1,500,000.00	1,500,000.00	-	131,250	12	1,575,000.00	1,575,000.00	-	137,500	12	1,650,000.00	1,650,000.00	-	143,750	12	1,725,000.00	1,725,000.00	-	150,000	12	1,800,000.00	1,800,000.00	-	8,250,000.00	8,250,000.00	-
1.5	Admin Officer PPS-7	1	90,000	12	1,080,000.00	1,080,000.00	-	94,500	12	1,134,000.00	1,134,000.00	-	99,000	12	1,188,000.00	1,188,000.00	-	103,500	12	1,242,000.00	1,242,000.00	-	108,000	12	1,296,000.00	1,296,000.00	-	5,940,000.00	5,940,000.00	-
1.6	Office Assistant PPS-6	2	60,000	12	1,440,000.00	1,440,000.00	-	63,000	12	1,512,000.00	1,512,000.00	-	66,000	12	1,584,000.00	1,584,000.00	-	69,000	12	1,656,000.00	1,656,000.00	-	72,000	12	1,728,000.00	1,728,000.00	-	7,920,000.00	7,920,000.00	-
1.7	Drivers PPS-4	4	30,000	12	1,440,000.00	1,440,000.00	-	31,500	12	1,512,000.00	1,512,000.00	-	33,000	12	1,584,000.00	1,584,000.00	-	34,500	12	1,656,000.00	1,656,000.00	-	36,000	12	1,728,000.00	1,728,000.00	-	7,920,000.00	7,920,000.00	-
1.8	Manager Utility Scale Solar PPS-9	1	175,000	12	2,100,000.00	2,100,000.00	-	183,750	12	2,205,000.00	2,205,000.00	-	192,500	12	2,310,000.00	2,310,000.00	-	201,250	12	2,415,000.00	2,415,000.00	-	210,000	12	2,520,000.00	2,520,000.00	-	11,550,000.00	11,550,000.00	-
1.9	Manager Distributed Solar PPS-9	1	175,000	12	2,100,000.00	2,100,000.00	-	183,750	12	2,205,000.00	2,205,000.00	-	192,500	12	2,310,000.00	2,310,000.00	-	201,250	12	2,415,000.00	2,415,000.00	-	210,000	12	2,520,000.00	2,520,000.00	-	11,550,000.00	11,550,000.00	-
1.10	Manager Solar Home Systems PPS-9	1	175,000	12	2,100,000.00	2,100,000.00	-	183,750	12	2,205,000.00	2,205,000.00	-	192,500	12	2,310,000.00	2,310,000.00	-	201,250	12	2,415,000.00	2,415,000.00	-	210,000	12	2,520,000.00	2,520,000.00	-	11,550,000.00	11,550,000.00	-
1.11	Monitoring & Evaluation Specialist PPS-9	1	175,000	12	2,100,000.00	2,100,000.00	-	183,750	12	2,205,000.00	2,205,000.00	-	192,500	12	2,310,000.00	2,310,000.00	-	201,250	12	2,415,000.00	2,415,000.00	-	210,000	12	2,520,000.00	2,520,000.00	-	11,550,000.00	11,550,000.00	-
1.12	IT Database Manager PPS-9	1	175,000	12	2,100,000.00	2,100,000.00	-	183,750	12	2,205,000.00	2,205,000.00	-	192,500	12	2,310,000.00	2,310,000.00	-	201,250	12	2,415,000.00	2,415,000.00	-	210,000	12	2,520,000.00	2,520,000.00	-	11,550,000.00	11,550,000.00	-
1.13	Database Analyst PPS-8	1	125,000	12	1,500,000.00	1,500,000.00	-	131,250	12	1,575,000.00	1,575,000.00	-	137,500	12	1,650,000.00	1,650,000.00	-	143,750	12	1,725,000.00	1,725,000.00	-	150,000	12	1,800,000.00	1,800,000.00	-	8,250,000.00	8,250,000.00	-
Sub. Total					24,000,000.00	24,000,000.00	-			25,263,000.00	25,263,000.00	-			26,466,000.00	26,466,000.00	-			27,669,000.00	27,669,000.00	-			28,872,000.00	28,872,000.00	-	132,330,000.00	132,330,000.00	-
2 Project Allowance					1,000,000	1,000,000.00	-			1,000,000	1,000,000.00	-			1,000,000	1,000,000.00	-			1,000,000	1,000,000.00	-			1,000,000	1,000,000.00	-	5,000,000.00	5,000,000.00	-
3 Purchase of Office Equipments																														
3.1 Personal Computers with LCD Display			Qty	Unit Cost	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total					
3.1	Personal Computers with LCD Display	3	100,000		300,000	300,000.00	-				-	-	100,000	3	300,000	300,000.00	-				-	-	100,000	3	300,000	300,000.00	-	900,000	900,000	-
3.2	Laptop	11	200,000		2,200,000	2,200,000.00	-				-	-	200,000	11	2,200,000	2,200,000.00	-				-	-	200,000	11	2,200,000	2,200,000.00	-	6,600,000	6,600,000	-
3.3	Printers Laser	3	30,000		90,000	90,000.00	-				-	-				-	-				-	-				-	90,000	90,000	-	
3.4	Color Copier Heavy Duty (all in one)	2	300,000		600,000	600,000.00	-				-	-				-	-				-	-				-	600,000	600,000	-	
3.5	LAN (Server, Switches, Wiring, wifi routers etc)	1	1,000,000		1,000,000	1,000,000.00	-				-	-				-	-				-	-				-	1,000,000	1,000,000	-	
3.6	PABX, Phone Sets, wiring and accessories	1	500,000		500,000	500,000.00	-				-	-				-	-				-	-				-	500,000	500,000	-	
3.7	CISCO Communication System	1	2,000,000		2,000,000	2,000,000.00	-				-	-				-	-				-	-				-	2,000,000	2,000,000	-	
3.8	Smartphone for on site progress reporting at ADP Progress Dashboard	11	60,000		660,000	660,000.00	-				-	-	60,000	10	600,000	600,000.00	-				-	-	60,000	10	600,000	600,000.00	-	1,860,000	1,860,000	-
3.9	Solar System with Battery Backup 10KVA	1	3,000,000		3,000,000	3,000,000.00	-				-	-				-	-	1,000,000	1	1,000,000	1,000,000.00	-				-	4,000,000	4,000,000	-	
Sub Total					10,350,000	10,350,000.00	-			-	-	-			3,100,000	3,100,000.00	-			1,000,000	1,000,000.00	-			3,100,000	3,100,000.00	-	17,550,000	17,550,000.00	-
4 Purchase of Vehicles																														
4.1 Toyota Fortuner AT/ with registration, tracker, accessories, tax, insurance etc			Qty	Unit Cost	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total					
4.1	Toyota Fortuner AT/ with registration, tracker, accessories, tax, insurance etc	1	6,000,000		6,000,000	6,000,000.00	-				-	-				-	-				-	-				-	6,000,000	6,000,000	-	
4.2	Toyota Hilux Revo AT (double cabin) 4x4 3.0 litre with registration, tracker, accessories, tax, insurance etc	3	5,000,000		15,000,000	15,000,000.00	-				-	-				-	-				-	-				-	15,000,000	15,000,000	-	
4.3	Insurance for vehicles	6	1,500,000	1	1,500,000	1,500,000.00	-				-	-				-	-				-	-				-	1,500,000	1,500,000	-	
4.4	Motorcycle	2	75,000		150,000	150,000.00	-				-	-				-	-				-	-				-	150,000	150,000	-	
Sub Total					22,650,000	22,650,000.00	-			-	-	-			-	-	-			-	-	-			-	-	22,650,000	22,650,000.00	-	
5 Operating Expenses																														
5.1 Purchase of stationery			Qty	Unit Cost	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total			Unit Cost	Qty	Total					
5.1	Purchase of stationery	1	480,000	12	480,000	480,000.00	-				-	-	480,000	12	480,000	480,000.00	-				-	-	480,000	12	480,000	480,000.00	-	2,400,000	2,400,000	-
5.2	Advertisement & Publications	1	500,000	12	500,000	500,000.00	-				-	-	500,000	12	500,000	500,000.00	-				-	-	500,000	12	500,000	500,000.00	-	2,500,000	2,500,000	-
5.3	POL	12	500,000	12	6,000,000	6,000,000.00	-				-	-	500,000	12	6,000,000	6,000,000.00	-				-	-	500,000	12	6,000,000	6,000,000.00	-	33,153,788	33,153,788	-
5.4	Repair & Maintenance (Vehicles and Others) 5% of capital cost per annum	1	300,000	12	3,600,000	3,600,000.00	-				-	-	315,000	12	3,780,000	3,780,000.00	-				-	-	364,652	12	4,375,824	4,375,824.00	-	19,892,273	19,892,273	-
5.5	Rent of Office Accommodation	1	350,000	12	4,200,000	4,200,000.00	-				-	-	385,000	12	4,620,000	4,620,000.00	-				-	-	512,435	12	6,149,220	6,149,220.00	-	25,641,420	25,641,420	-
5.6	Utilities (electricity, Water)	1	250,000	12	3,000,000	3,000,000.00	-				-	-	262,500	12	3,150,000	3,150,000.00	-				-	-	303,877	12	3,646,519	3,646,519.00	-	16,576,894	16,576,894	-
5.7	TADA	1	1,876,854	12	1,876,854	1,876,854.00	-				-	-	2,100,000	1	2,100,000	2,100,000.00	-				-	-	2,431,013	1	2,431,013	2,431,012.50	-	10,928,117	10,928,117	-
5.8	Repair & Maintenance Other Equipment	1	200,000	12	2,400,000	2,400,000.00	-				-	-	210,000	1	210,000	210,000.00	-				-	-	242,972	1	242,972	242,972.50	-	1,100,997	1,100,997	-
5.9	Operating Cost of Ciso System	1	800,000	12	9,600,000	9,600,000.00	-				-	-	840,000	1	840,000	840,000.00	-				-	-	972,405	1	972,405	972,405.00	-	4,420,505	4,420,505	-
5.10	Office Fitting/Establishment	1	20,000,000		20,000,000	20,000,000.00	-				-	-				-	-				-	-				-	20,000,000	20,000,000	-	
Sub. Total					40,656,854	40,656,854.00	-			21,980,000	21,980,000.00	-			23,261,150	23,261,150.00	-			24,629,150	24,629,150.00	-			26,090,589					

PHASING OF COSTS AS PER FORMAT

12848.11

PROJECT FINANCIAL ANALYSIS

The Project is financially feasible for both Components 1 and 2. The initial 50 MW solar plant assumes a debt to equity ratio of 75:25 and access to non-recourse project financing through international finance institutions such as the IFC. The feasibility of the solar plant was analyzed based on the cost estimation from the project feasibility study and the plant capacity factor specific to the region. The equity internal rate of return ("IRR") for the solar plant is 15 percent for a EPA price of \$0.048 per kWh against a weighted average cost of capital ("WACC") of 8.7 percent. For the rooftop component, assuming 100% debt financing by IDA loan, the FIRR is 33.2 percent and the NPV of the total savings from 20 MW rooftop installation is \$21.3 million, which can be offset against electricity bills.

PROJECT ECONOMIC ANALYSIS

The economic analysis confirms net economic benefit from all three project components. The economic internal rate of return (EIRR) and net present value (NPV) of the benefits for each component are calculated using standard cost-benefit methodology². The economic analysis indicates that the Project's components are viable even without factoring in the environmental benefits. The total lifetime GHG emissions avoided from the Project is approximately 1,085,117 tons of CO₂ equivalent. The table below shows the breakdown of the analysis per component. As per the approach for climate co-benefits assessment laid out in the 2016 Joint Report on MDB's Climate Finance³, the Project can claim 100 percent climate co-benefits as it is a Category 1.1 Renewable Energy Solar Project.

Table 1: Summary of economic analysis

	50 MW Solar PV Plant	20 MW Distributed Solar	Solar home systems
EIRR	18.0%	28.8%	17.1%
EIRR including GHG Emissions	23.0%	36.6%	17.3%
Net Economic Benefits	\$42.64 m	\$29.99 m	\$99.55 m
GHG Emissions Avoided (tons)	683,953	407,879	35,990

² Full details of the assumptions and methodology are available here:

<http://wbdocs.worldbank.org/wbdocs/dri/objectid/090224b085716529>

³ European Investment Bank. 2016. "Joint Report on Multilateral Development Banks' Climate Finance".

<http://www.eib.org/attachments/press/2016-joint-report-on-mdbs-climate-finance.pdf>

IMPLEMENTATION SCHEDULE OF THE PROJECT

After approval of the scheme following implementation schedule will be followed accordingly:

Year 1

- The Project Management Unit within Sindh Energy Department will be set up including procurement of office space, refurbishment, and hiring of staff
- **Component 1**
 - The transaction advisor for Grid connected component will be procured
 - All interested private companies invited for workshop on reverse auction methodology
 - All relevant permits and contracts for off-take and EPA will be acquired for component 1
 - Reverse auction for 50MW pilot for component 1 will take place end of the year
- **Component 2**
 - Detailed survey of government buildings will be conducted and buildings to be included in the program will be selected
 - Transaction advisor for the component will be competitively selected and appointed
 - Feasibility analysis will be conducted for all buildings identified
- **Component 3**
 - Vendor for M&E, consumer awareness and engagement will be competitively procured
 - Household survey identifying areas for deployment of solar home system will be completed
 - Consumer awareness and engagement including above the line and below the line campaigns will be initiated
 - Competitive bidding for pilot
 - Pilot SHS deployed
 - Monitoring and Evaluation for the pilot conducted

Year 2- Year 5

- **Component 1**

- Reverse auction for round 2 of solar park will take place end of year 2, beginning of year 3
- Upgrade work on solar park infrastructure including transmission lines, substation upgrades and fencing for round 3 will be started
- **Component 2**
 - Monitoring and evaluation of O&M and installation of round 1 of installations
 - Procurement of EPC for round 1 will take place in year 2 and for round 3 in year 3 with installation in year 3-4
 - Procurement of EPC for round 3 of installations will take place in year 4 with installation in year 4 continuing to year 5
 - Monitoring of work completed and the O&M of the installed distributed solar facilities will continue through the period
- **Component 3**
 - Competitive bidding for the areas identified during initial assessment of the household survey will take place each year.
 - Consumer awareness and engagement will be conducted each year
 - Monitoring and evaluation surveys will continue yearly

TERMS OF REFERENCE OF PROJECT STAFF

Project Director:

Mode of Appointment: Full time (on contract basis)

Scope of Work for the PMU Director is but not limited to the following:

1. Project Director will be an overall in charge of the project in terms of physical and financial progress of the project;
2. Will be responsible to execute the project as per requirements given in the PC-I and guidelines provided by the Government of Sindh and the World Bank;
3. Will be responsible for all aspects of the project implementation, and will be supported by Project Supervision and Contract Management staff and/or consultants as well as M&E staff/consultants as required;
4. Will be responsible to (i) design and implementation of the Project activities; (ii) data collection and monitoring, (iii) supervision of procurement related activities (iv) preparation of annual work plan for all Project's activities and annual financial requirements, and (v) supervision and reporting on implementation of Environmental and Social Management Plans ("ESMP") and Resettlement Action Plans ("RAP") as required through project staff hired under the PMU of the project;
5. Responsible for (i) monitoring of the physical progress; (ii) monitoring and evaluation of the project impact; (iii) review and supervision of the environmental and social aspects of the project; and (iv) provision of guidance to the management in early identification and resolution of the Project related issues. The scope of work will include: (i) the establishment of Management Information Systems ("MIS"), Geographic Information System ("GIS") and Information and Communication Technology ("ICT") based monitoring and verification systems for all project components and activities.
6. Provide regular briefing and periodical reports to Sindh Energy Department (SED) and to the World Bank based on the reports received by the PMU staff, other PCU's coordinators and long- and short-term consultants.
7. Assist the SED on setting strategies and targets in order to ensure the achievement of the project objectives.
8. Lead and manage the staff of the PMU and PCU's in carrying out the day-to-day activities in support of implementation of the projects.
9. Coordinate with SED on acquiring of adequate facilities and other recourses to ensure the efficient operation of the PMU and fulfillment of responsibilities.
10. Work in close cooperation with respective line ministries / PCUs to ensure that goods and services under the Credits are procured in accordance with World Bank Guidelines.
11. Supervise the financial management system, including records and accounts, and prepare financial statements in a format acceptable to the International Development Association, adequate to reflect the operations; ensure audit of Project accounts as per rules of the Government of Sindh and the requirements of the IDA stipulated in the Development Credit Agreement and the Sub-Credit Agreement.

Duration:

The initial duration of the contract will be for two years and is extendable upon satisfactory performance

Conflict of Interest:

The Director shall not be involved in another assignment that represents a conflict of interest to the prevailing assignment.

Qualification and Experience:

The Director should have a Master's Degree in engineering/economics/ management sciences. The Director should have energy sector background with at least 10 years experience in a responsible management position. In addition, the Director will need to have experience in dealing with international and bilateral organizations since the project requires close collaboration with other donors active in the sector. Working knowledge of English and computer skills are required. Knowledge/experience with WB procedures could be an advantage.

Expected Outputs:

Successful and timely completion of the Project supported by visible use of project management tools.

Input by the SED:

The SED will provide necessary support to the Director for establishment of complete office infrastructure, provision of the required equipment, tools of trade, and access to any documentation and information necessary for the performance of Director's tasks.

Procurement Manager:

Mode of Appointment: Full time (on contract basis)

Scope of Work for the Procurement Manager is but not limited to the following:

1. Develop, monitor and implement need based Procurement Plan to implement Project ensuring timely completion of all procurement activities
2. Contribute to the development of the Annual Work Plan, ensuring alignment with project's strategies, agreement on annual targets in the work plan with budgeting;
3. Assist technical teams with development of generic and policy compliant ToRs and specifications; as relevant;
4. Carry the overall responsibility for all the Procurement functions at project level;
5. Ensure compliance with legal requirements of project in procurement actions and submissions for engaging consultants, procuring goods and work requirements;
6. Ensure compliance with various fiduciary controls, etc. as stated in the Procurement Operations Manual in the procurement process and propose improvement's; if any;
7. Manage the complete procurement cycle, including advertising process for procurement, procurement correspondence, bids receipt, bids opening, contract negotiations, contract signings etc. in strict accordance with Bank's Procurement and Consultants Guidelines or GoS prevailing rules/policies which so ever is applicable;
8. Receive and review Purchase Request (PR) in accordance with the plan and budget and facilitate;
9. Maximize efficiency of procurement cycle by providing strategic expert advice and implementing necessary controls ensuring transparency cost effectiveness and soundness of all procurements carried out under the project;
10. Address all matters associated e.g. taxation, duties clearance, with support of financial management team
11. Monitor and record the progress of procurement activities by regularly updating Systematic Tracking of Exchanges in Procurement (STEP);

12. Liaise and coordinate with the World Bank and its supervision missions with the approval of the Project Director;
13. Design/ update and facilitate the management of the overall procurement and inventory management record and filing system;
14. Comply with the monitoring system for procurement and ensure the completion of the procurement process according to the procurement plan besides the Contract Management adhering to the Contract Agreements/Supply Orders;
15. Assist various audits/ex-post review outfits in performance of their tasks by ensuring that procurement document is efficiently filed and provide complete track of procurement cycle;
16. Ensure adherence of the ongoing contract agreements/supply orders with all the defined conditionality and processing of the payments after taking compliance report on deliverables from technical experts;
17. Provide assistance to the Programme Manager in following areas related to his/her assignment: -
 - a. Looking after the level of transparency in procurement process;
 - b. Dispute Resolution;
 - c. Reviewing the whole supply chain and identification of any gaps and their plugging measures;
 - d. Assessing and identifying the risks like institutional, political, organizational, procedural, etc. that may negatively affect the ability of the agency to carry out the procurement process;
 - e. Managing the process of procurement complaint resolution;
18. Respond adequately and timely to audit queries;
19. Oversee the preparation and revision of contracts that involve the purchase of goods and services, with support of relevant technical teams
20. Oversee administration of contracts.
21. Negotiate terms and conditions with support of relevant technical teams
22. Prepare contract briefs and revision summarizing contractual requirements and budgets;
23. Prepare contract amendments notices, monitor contract performance, including the reporting and status of contracts;
24. Perform closing activities as needed;
25. Any other relevant task assigned by the Competent Authority.

REPORTING:

Will report directly to the project director.

Qualification and Experience:

- At least a Master's degree from Higher Education Commission recognized University in Management Sciences/Statistics/Economics/Finance/Engineering or Commerce or related field from reputable local or foreign institution. A certificate/diploma/degree in the

field of Procurement Management from reputable local or foreign institution shall an advantage.

- Should have at least 10 (ten) years' experience in the procurement processes with the public / private projects involving procurement of goods and/or works & services
- Excellent knowledge of relevant rules and legislation of World Bank, Sindh Public Procurement Regulatory Authority and other donor agencies including international procurement best practices. Specifically, sound Knowledge of World Bank Procurement Guidelines, Procedures and reporting requirements shall be preferred.
- Should have an in-depth understanding of procurement cycle management.
- Proven ability to work in a collaborative, team environment.
- Should have excellent command on MS office

Duration:

The initial duration of the contract will be for two years and is extendable.

The Procurement Manager shall not be involved in another assignment that represents a conflict of interest to the prevailing assignment.

Accounting Officer:

Scope of Work/Key Responsibilities are but not limited to the following:

The Accounting Officer will be responsible to undertake following activities:

1. Be responsible for activities related to financial management required for project implementation;
2. Implement sound accounting system and maintain up to date accounts while ensuring that these conform to the World Bank's as well as Government of Sindh's requirements;
3. Ensure the smooth day-to-day administration of the project funds in conformity with the administrative and financial procedures;
4. Assist the Program in opening, management of Segregated Designated Assignment Accounts (local and foreign currency accounts), following the standard procedures and as per the conditions laid out in the project Grant Agreement;
5. Prepare and provide support in preparation, documentation of regular reports on expenditure and budget control; Budget forecast according to the World Bank's and Government of Sindh's prescribed formats;
6. Handling of cash Books, Stock Register, Cheque Register, Cash Register, Reconciliation Statements etc. in accordance with the Government of Sindh;
7. Advise and assist in all aspects related to allowances, salary, travel claims and other financial matters; Verify invoices, bills and documents in order to ensure the correct payments;
8. Ensure that all advances and direct payments are well recorded and justified
9. Prepare the disbursement reports; Periodic implementation progress reports; Annual and Quarterly financial reports on the basis of corresponding work plans and budget;
10. Liaison and Coordination with the World Bank and its relevant team member on financial matters;
11. Prepare withdrawal applications using supporting documents that should also be prepared according to the World Bank disbursement procedure (Statements of expenditures and Summary sheets, Reconciliation statements of the Special Account);
12. Assist in arrangements for audit of the Project whenever required;

DURATION:

Initial duration of contract will be for two years and extendable based on performance

REPORTING:

Will report directly to the project director.

QUALIFICATIONS AND EXPERIENCE:

The required qualifications and experience are as follows:

1. At least Master's Degree from HEC recognized University preferably in Accounting or Finance, preferably CMA/CPA/CA/ACCA (or equivalent).
2. At least five (5) year's progressive experience of financial management services (post-qualification) in the public and private energy sector.

Environment & Social Development Officer:

Scope of Work for the Environment & Social Development Officer is but not limited to the following:

The Social Development Specialist will be responsible for the supervision of the implementation of Environmental and Social Management Framework (ESMF) ESMF, including Resettlement Policy Framework (RPF, if applicable), Environmental and Social Management Plans (ESMPs) and Checklists that will be prepared for the sub-projects.

Duties of Assignment / Deliverables

The Social Development Specialist will be responsible for the supervision of the implementation of Environmental and Social Management Framework (ESMF), including Resettlement Policy Framework (if applicable), Environmental and Social Management Plans (ESMP) and checklists that will be prepared for the sub-projects.

The main responsibilities of the Social Safeguards Specialist will include but not limited to the following:

1. Deal with the Social Safeguards aspects and provide feedback to the Project Director on implementation of Environmental and Social Management Framework (ESMF) of the project;
2. provide support to the Project Management Unit (PMU) for ensuring compliance with the World Bank and Government of Sindh conditions and covenants pertaining to the Social Safeguards;
3. Implementation of all aspects identified in ESMF including also the social screening and filling the screening checklists for each sub-project/scheme to be undertaken;
4. Preparation of the mitigation checklists of the infrastructure schemes as required by the ESMF, Environmental and Social Management Plan (ESMP), and Resettlement Action Plans (RAP);
5. Support the Project Management Unit (PMU) and ensure the implementation of the applicable land acquisition procedures developed for the project, if applicable;
6. Carrying out frequent field visits and conduct monitoring of the implementation of mitigation measures outlined in ESMPs and RAP/s,
7. Organize and conduct the trainings on Social Safeguards aspects of the project including ESMF implementation, preparation of mitigation checklists, conducting monitoring, implementation of land acquisition procedures, Grievance Redress Mechanism (GRM), Citizens Engagement, and Community Consultations, etc.
8. Support the functioning of the GRM in accordance with the requirements of the ESMF, GRM procedures and operational manual of the project;
9. Carry out the community and stakeholder consultations in accordance with requirements of ESMF, mitigation checklists and World Bank Social Safeguards;

10. To ensure that the project remains in compliance with the World Bank Social Safeguard policies and guidelines;
11. Prepare the ESMP and RAP Quarterly Progress Report (QPR) and ensure its timely submission to the World Bank;
12. Review and revision of documents and ensuring timely delivery of outputs as agreed between The World Bank and the project.;
13. Supervising and supporting all relevant entities in achieving their responsibilities as outlined in the ESMF and ESMPs and Checklists.
14. Implementation of all aspects of ESMF including screening and filling the screening checklists for each subproject to be undertaken under SSEP.
15. Conduct/manage ESMF trainings in accordance with the Training Framework provided in the ESMF.
16. Providing support for and monitoring the performance of the grievance redress system; data analysis; follow-up surveys, etc.).
17. Responding to safeguard incidents and concerns as required.

The Social Development Specialist will ensure that the project remains in compliance with the following World Bank operational policies and guidelines:

- OP / BP 4.12 Involuntary Resettlement
- World Bank Guidance on Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx
- World Bank Environmental Health and Safety Guidelines

Experience and Qualification:

The Social Development Specialist should have a Master's degree (sixteen years of education) in Social Science or other relevant discipline and have sound knowledge of the social safeguard policies and guidelines of the World Bank and Government of Sindh. S/he should possess a minimum experience of five years in preparing social/community mobilization, social safeguard analyses and relevant documentation, and in their implementation and monitoring in development sector where experience with World Bank funded projects will be an added advantage.

E. Contract Duration

The Social Development Specialist is expected to commence services initially for two years. The assignment is likely to be extended for life of Program depending upon satisfactory performance of the outputs envisaged in the TORs.

F. Reporting Obligations

The Consultant will report to Project Director. The Social Development Specialist's performance will be reviewed on annual basis.

Admin Officer:

Mode of Appointment: Full time on contract basis

Reporting Obligations

The Admin Officer will report to the Project Director.

Scope of Work:

Admin Officer will be responsible to the following but not limited to it:

1. Manage office supplies stock and placing orders
2. Prepare regular financial and administrative reports
3. Administrate of PMU office databases
4. Manage office supplies stock and place orders
5. Prepare regular reports on expenses and office budgets
6. Maintain and update PMU office databases
7. Organize a filing system for important and confidential documents
8. Answer queries by employees
9. Update office policies as needed
10. Maintain a company calendar and schedule appointments
11. Book meeting rooms as required
12. Distribute and store correspondence (e.g. letters, emails and packages)
13. Prepare reports and presentations with statistical data as assigned
14. Arrange travel and accommodations
15. Schedule in-house and external events
16. Plan and coordinate administrative procedures and systems and devise ways to streamline processes
17. Help in recruitment and train personnel and allocate responsibilities and office space
18. Assess staff performance and provide coaching and guidance to ensure maximum efficiency
19. Ensure the smooth and adequate flow of information within the PMU to facilitate other operations
20. Manage schedules and deadlines
21. Monitor inventory of office supplies and the purchasing of new material with attention to budgetary constraints
22. Monitor costs and expenses to assist in budget preparation
23. Oversee facilities services, maintenance activities and tradespersons
24. Organize and supervise other office activities (recycling, renovations, event planning etc.)
25. Ensure operations adhere to policies and regulations
26. Keep abreast with all organizational changes and business developments

Experience and Qualification:

Adequate proven experience as administration manager, In-depth understanding of office management procedures and departmental and legal policies, familiarity with financial and facilities management principles, proficient in MS Office, an analytical mind with problem-solving skills, excellent organizational and multitasking abilities, a team player with leadership skills, MBA in business administration or relative field with 10 years of post-qualification working experience.

Manager Utility Scale Solar:

Mode of Appointment: Full time on contract basis

Reporting Obligations

The Manager Utility Scale Solar will report to the Project Director.

Scope of Work:

Manager Utility Scale Solar will be responsible for but not limited to the following tasks:

1. To establish series of Solar Parks to leverage private sector development of solar PV through the use of competitive bidding;
2. Carry out international solar auction for an initial 50 MW project, which can be up-scaled upto 400 MW in the form of Solar Parks.
3. Arrange necessary permits, and provide support to EPC in power evacuation by the utility.
4. Implement the upfront development of shared infrastructure such as the grid connection, roads, security and water supply etc for solar parks in light of the approved PC-I;
5. Support the Transaction Advisor in the design and implementation a 50 MW solar auction.
6. Implement the Utility scale solar component as described in PC-I, under guidance of Energy Department, Government of Sindh and WB through Project Director
7. Will evaluate proposals received during solar auctions, will hire consultants for conducting feasibility studies (if any) for establishment of solar parks;
8. Will carry out and monitor all activities pertaining to utility scale solar component of the Project as per guidelines/requirements of GoS and World Bank
9. Any other assignment given by the Project Director pertaining to the utility scale solar component of the project.

Qualification and Experience:

The Manager should have a Bachelors degree preferably in electrical engineering

. He should have a technical background and at least 10 years relevant experience in energy sector in a responsible position in order to effectively deal with utility scale component issues which will arise during the course of implementation. The Manager should have good working relationships at the senior and technical levels of the Government and have proven ability to communicate with high level government officials, staff other ministries and GoP agencies. In addition, the Manager will need to have experience in dealing with international and bilateral organizations since the project requires close collaboration with other donors active in the sector. Working knowledge of English and computer skills are required. Knowledge/experience with WB procedures could be an advantage.

E. Contract Duration

The Social Development Specialist is expected to commence services initially for two years. The assignment is likely to be extended on satisfactory performance as envisaged in the TORs.

F. Reporting Obligations

The Manager will report to Project Director.

Manager Distributed Solar:

Mode of Appointment: Full time on contract basis

Reporting Obligations

The Manager Distributed Solar will report to the Project Director.

Scope of Work:

Manager Utility Scale Solar will be responsible for but not limited to the following tasks:

1. Will establish at least 20 MW of distributed solar PV on the rooftops and other available spaces on and around public-sector buildings in Sindh;
2. Will get identified public buildings for utilization of their spare rooftop and other available space;
3. Implement the Distributed Solar component of the project as defined in PC-I to achieve the following goals: (i) reducing recurrent expenditure on electricity by GoS, freeing up budget for other priorities; (ii) providing the DISCOs with cost-effective power during periods of high air conditioning load, while allowing the payments to be netted off against outstanding public sector debts; (iii) building private sector experience in constructing and operating large distributed solar PV installations, thereby reducing costs; and (iv) improving the supply of affordable power to consumers, without the need for ancillary transmission investment.
4. With help of SED identify portfolios of candidate sites and liaise with other GoS departments to establish a leasing agreement for target institutions.
5. Will evaluate proposals received during implementation of the component and hire consultants for conducting feasibility studies (if any);
6. Will carry out and monitor all activities pertaining to distributed solar component of the Project as per guidelines/requirements of GoS and World Bank
7. Carryout any other assignment given by the Project Director pertaining to the Distributed Solar component of the project.

Qualification and Experience:

The Manager should have a Bachelors degree preferably in engineering or economics. He should have energy sector background and at least 10 years relevant experience in a responsible position in order to effectively deal with Distributed Solar component issues which will arise during the course of implementation. The Manager should have good working relationships at the senior and technical levels of the Government and have proven ability to communicate with high level government officials. Working knowledge of English and computer skills are required.

E. Contract Duration

The Social Development Specialist is expected to commence services initially for two years. The assignment is likely to be extended for life of Program depending upon satisfactory performance and the outputs envisaged in the TORs.

F. Reporting Obligations

The Consultant will report to Project Director.

Manager Solar Home Systems:

Scope of Work for the Manager Solar Home Systems:

The Manager Solar Home Systems will be responsible for but not limited to the following tasks:

1. Design the implementation plan to deliver 200,000 households with solar home systems in Sindh
2. Provide regular briefing and periodical reports to Project Director on the progress of activities related to the deployment and execution of the Solar Home System component.
3. Assist the PMU on setting strategies and targets to ensure the achievement of annual targets for the successful deployment of the Solar Home System component
4. With the assistance of corresponding staff, develop and oversee the implementation of all activities related to the deployment of the Solar Home System component of the project. These activities include but are not limited to, contracting third parties for consumer awareness and engagement, household surveys for market assessment and monitoring and evaluation of the progress of the solar service providers.
5. Work in close cooperation with contracted third parties to ensure that services related to community engagement and awareness, solar service providers are procured in accordance with World Bank Guidelines and project design.
6. Work in close cooperation with the procurement officer, and together with them provide first-line contact with interested solar service providers regarding the status of project-related activities, and planned or on-going procurement.
7. Ensure regular monitoring of the status of project activities (through the preparation and updating of implementation plans and schedules, operations manuals, disbursement projections, etc.), including preparation and transmission of comprehensive progress reports as required.

Duration of job:

The initial duration of the contract will be two years, extendable by mutual consent for an a period agreed between the parties. The Manager shall not be involved in another assignment that represents a conflict of interest to the prevailing assignment.

Qualification and Experience:

The Manager should have Bachelors degree in Electrical Engineering with Masters in Management Sciences and substantial project development and execution experience. Preferably, the Manager should have a background/experience in provisioning of energy access to off-grid and grid-deficient areas. Experience in micro-finance sector would be a plus. The manager should have good working relationships at the senior and technical levels of the Government and have proven ability to communicate with high level government officials and staff other ministries and local governments. Experience with private sector solar companies will be considered important. In addition, the manager will need to have experience in dealing with international and bilateral organizations since the project requires close collaboration with other donors active in the sector. Working knowledge of English and computer skills are required. Knowledge/experience with WB procedures could be an advantage.

Expected Outputs

Monthly management reports, annual budgets, and mid-term review related to the Solar Home System component. Day-to-day management of the project will require the preparation of ad hoc reports and papers as the needs of the project arise

Monitoring & Evaluation Specialist:***Scope of Work and Activities to Be Undertaken:***

Specifically, the M&E Specialist will be responsible for the following duties and responsibilities;

- Develop M&E Framework for all three components of the project
- Conduct trainings, awareness programs and develop guidelines required for effective implementation of M&E framework.

- To have knowledge of the existing data sources and instruments available and the type of evidence required to assess progress towards results
- Attain in depth knowledge of the project, and understand key parameters. Monitor and analyze key parameters using M&E tools and recommend corrective actions.
- Oversee third party monitoring teams for all three components.
- Liaise with third-party monitoring team from Planning and Development Department, Government of Sindh.
- Establish sound and effective M&E mechanisms by supporting; i) third party validation, ii) evaluation, in collaboration with centers of knowledge and excellence, of interventions to assess on-going implementation as well as un-intended consequences; and iii) collection of real-time data directly consolidated into electronic systems and made available through management dashboards
- Liaise with the IT and database team to set up the remote monitoring unit for the Solar Home System Component.
- Interact and liaise with World Bank and arrange regular updates, briefings etc. in the area of M&E
- Supervise and monitor the project's overall implementation and
- Other related tasks that the Coordinator may find necessary within this context.

Deliverables/Specific Outputs Expected

- Support establishment and operationalizing of the PMU Data Monitoring and Evaluation within 12 months of signing of the contract, in collaboration with the It and Database team
- Support institution of baseline for the evaluation of the Sindh Solar Energy Program, in collaboration with the external M&E firm hired.
- Monitor and coordinate reporting of all activities being implemented through the PMU in the form of monthly progress report, including report on gender-segregated beneficiaries data on the outcomes of SSEP interventions
- Use innovative data collection tools (Telco and IT based, third party monitoring) to improve governance and accountability. Explore options to link both elements in M & E system.
- Assist in the designing, implementation and monitoring of impact evaluation for all SSEP component activities.
- Timely follow-ups on actions agreed with the World Bank Group Task Team.

Profile /Qualifications

- Master's degree in Management Sciences, Public Administration, and Business Administration, Systems designing or a related discipline.
- Solid understanding of monitoring and evaluation tools and mechanisms and its implementation in the field as evidenced in the relevant experience.
- Gender equity and equality would be given weightage.
- Familiarity with government departments and systems would be accorded
- Written and oral fluency in Urdu, and English. Fluency in Pushto shall be accorded due weightage
- Demonstrated Computer Skill (Proficiency in using computer desktop application MS Office (Word, Excel, and Power Point).

Institutional Arrangements and Reporting:

It is recognized that activities may undergo with frequent changes in a view of dynamic environment and implementation operational & ground realities. Therefore the M&E Specialist is expected to be flexible and adapt to requirement of process. The M&E Specialist will work in SSEP PMU and perform the assigned tasks and will report to the Project Director.

IT Database Manager:

Rationale for hiring the IT Database Manager (ITDM)

1. To serve as the focal point for all ITDM related activities identified under the program. To work with close liaison with the rest of the Program Managers, project teams, Energy Department, Government of Sindh, and World Bank consultants to achieve the objectives of the project.

Scope of Work and Activities to Be Undertaken are but not limited to the following:

Under guidance of the Project Director ITDM is responsible for learning and professional development of Government officials and project staff for improving outcomes of the project, the ITDM will be responsible for the following duties and responsibilities;

- (i) **Develop and document comprehensive Information Systems for information and communication technology related required to be put in place to support program objectives in collaboration with World Bank technical teams.**

To accomplish this manager will:

- a) Develop and document a comprehensive understanding of the fundamental business processes associated with the project.
- b) Discuss with the vendors regarding business processes and needs for management information systems;
- c) Review and document the current information systems capabilities, including hardware and software available, in-house data processing organization, resources, staff skills, status of current application systems and assess how well they can serve the ERP's system requirements;
- d) Develop a citizen engagement strategy
- e) Develop IT based tools for citizen engagement
- f) Training staff in citizen engagement, data collection and analysis

- (ii) The consultant would determine the resources required for implementation of technology architecture. It would include:

- a) Hardware, communications networks, systems software and application development, package customization costs including external and local consulting services.
- b) Conversion costs, if applicable;
- c) Ongoing operational, including maintenance costs if applicable; and
- d) Trainings;

- (iii) The consultant would develop implementation plan for systems developed in house or out sourced, set priorities for systems development based on the strategic objectives and IT opportunities identified by management; and specify tentative implementation schedules.

- (iv) **Assist with the preparation of bidding documents.** In the area of bidding document preparation, the consultant will, among other things, assist the procurement team to review and revise the Technical Requirements Section of the Bidding Documents for clarity and for completeness.

- (v) **Review and comment on specific issues.** The consultant will review and comment on (a) bidder qualification criteria (financial, experience, technical capacities, etc.); (b) technical evaluation criteria and (if appropriate) a technical scoring scheme; (c) post qualification measures; (d) requirements for software development and other matters of intellectual property rights; and (e) conduct briefings and presentations to stakeholders and decision-takers, as required and appropriate.

- (vi) **Assist with bid evaluation.** During the process of bid evaluation, the consultant will, among other things, (a) participate in "Bid Clarification Meetings" related to Technology Architecture between Government and Bidders as part of the first stage technical proposal evaluations; (b) assist in the preparation of any addendum to the bidding documents; (c) assist to conduct briefings and presentations to stakeholders and decision-takers, as required and appropriate

- (vii) Monitor day-to-day implementation of the program activities, analyze problems that hamper their implementation and advise the coordinator on appropriate measures to ensure timely delivery of required outputs and achievement of measurable results related to Information and Communication Technology.
- (viii) Strengthen capacity of government and program officials on ICT issues and their preparation towards ICT usage at all levels through development of various training modules and reference materials
- (ix) Develop terms of reference and scope of work of the system assessments envisaged under the program; to assess the quality of the undertaken assessments and to provide operational recommendations for further systems' integration and development including identification of other target databases, institutional strengthening and hardware procurement investments etc.;
- (x) Carry out any additional task(s) assigned by project director to achieve the objectives of project.

Profile /Qualifications

- A master's degree in Computer Sciences / MIS / Business Administration (specialization in IT) or with a major in a relevant discipline. MIS related qualification/certifications will be accorded due weightage
- Atleast 10 years' experience in IT field, after acquiring stipulated qualification, at the national level or with the International Organizations / Donor projects. (including the Public sector ICT solutions);
- Very good understanding of government functioning and protocols as evidenced in the past experience of candidate.
- Should have strong communication and problem solving skills.
- Excellent technical and conceptual knowledge about MIS.
- Excellent grasp of public financial management principles and practices; and
- Prior work experience in crisis affected areas would be given weightage.
- Demonstrated Computer Skill (Proficiency in using computer desktop application MS Office (Word, Excel, and Power Point).
- Written and oral fluency in English is required. Proficiency in, Pashto and Urdu shall be accorded due weightage
- Experience in information technology assessment and development and knowledge of relevant global practices;
- Experience in the area of information system applications with citizens servicing systems is advantage.

Institutional Arrangements and Reporting:

It is recognized that activities may undergo with frequent changes in a view of dynamic environment and implementation operational & ground realities. Therefore the ITDM is expected to be flexible and adapt to requirement of process. The ITDM will work in PMU to perform the assigned tasks and will report to the Project Director.

Data Analyst:

Scope of Work and Activities to Be Undertaken:

- Assist team members with data collection and analysis pertaining to the performance of all three components.
- Develop monitoring plan in conjunction with latest technology tools such as telco-and GSM based platforms to develop monitoring plan for component 3.
- Coordinate with external consultants and private vendors to collect and compile data particularly that pertaining to component 3, Solar home systems

- Review the data and information systems (collection and maintenance) of the project
- Any other responsibilities assigned to him/her by the Project Director, project managers and Database manager.

Deliverables/Specific Outputs Expected

- Monthly progress report of work program pertaining the component 3 and data received regarding number of systems installed, and performance of the systems.
- Minutes of all project meetings and consultations analysed and kept;
- Analysis of all necessary data and information related to the project
- Improved information and data management systems of the PMU.

Qualifications

- At least three years of experience of practical experience in the field
- Bachelors degree in IT, Economics, Statistics
- Experience in working as part of a multidisciplinary team of experts and consultants;
- Excellent communication, analysis and writing skills;
- Fluency in English (oral and written) is a requirement;
- Excellent data management skills, advanced knowledge of MS Excel and STATA

Institutional Arrangements and Reporting:

It is recognized that activities may undergo frequent changes in a view of dynamic environment and implementation operational & ground realities. Therefore the Data Analyst is expected to be flexible and adapt to requirement of process. The Data Analyst will work in SSEP PMU and perform the assigned tasks and will report to the Manager of Component 3; Solar Home System.

**STANDARD PAY PACKAGE NOTIFIED BY FINANCE DEPARTMENT
GOVERNMENT OF SINDH**



NO.FD (SR-III)5-29/2008(A)
GOVERNMENT OF SINDH
FINANCE DEPARTMENT

Karachi, dated the 21st September, 2017

From:-

SYED HASAN NAQVI,
Secretary to Government of Sindh.

To,

1. The Chief Secretary to Government of Sindh.
2. The Chairman, Planning & Development Board, Karachi.
3. All Additional Chief Secretaries to Government of Sindh.
4. The Senior Member, Board of Revenue, Sindh.
5. All Administrative Secretaries to Government of Sindh.
6. All Members, Board of Revenue, Sindh.
7. The Principal Secretary to Chief Minister Sindh.
8. The Principal Secretary to Governor, Sindh, Karachi.
9. The Secretary to Provincial Assembly Sindh.
10. All Heads of Attached Departments, Sindh.
11. All Regional Heads of Department, Sindh.
12. All District & Sessions Judges, Sindh.
13. The Registrar, High Court of Sindh.
14. All Commissioners in Sindh.
15. The Registrar, Sindh Services Tribunal, Karachi.
16. The Secretary, Sindh Public Service Commission, Karachi.
17. The Secretary, Provincial Ombudsman Secretariat Sindh, Karachi.

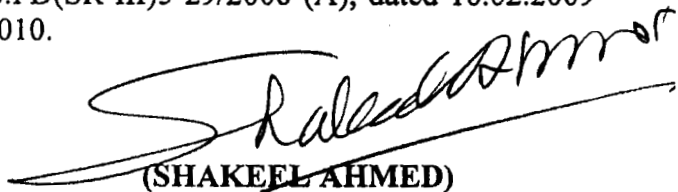
SUBJECT: STANDARD PAY PACKAGE FOR THE PROJECT STAFF DIRECTLY RECRUITED FOR DEVELOPMENT PROJECTS FUNDED FROM PSDP

In continuation of this department's Office Memoranda No.FD(SR-III)5-29-2008(A), dated 16th February, 2009 and dated 11th Mach, 2010 and with the approval of Competent Authority (i.e. Chief Minister, Sindh), Government of Sindh has been pleased to revise the Standard Pay Package for officers / staff directly recruited from open market on the basis of competitive recruitment for the execution of Development Projects/Programs funded from Provincial Budget including ADP and Foreign Aided Projects/Programs with immediate effect:-

Project Pay Scale (PPS)	Regular BPS	Existing Rate with 5% Annual Increment (In Rs.)		Revised Rate with 5% Annual Increment (In Rs.)	
		Minimum	Maximum	Minimum	Maximum
PPS-1	BPS-1-4	7,000	10,000	16,000	25,600
PPS-2	BPS-5-8	10,000	15,000	20,000	33,000
PPS-3	BPS-9-10	10,000	15,000	25,000	40,000
PPS-4	BPS-11-13	15,000	25,000	30,000	48,000
PPS-5	BPS-14-15	15,000	25,000	40,000	64,000
PPS-6	BPS-16	30,000	35,000	60,000	96,000
PPS-7	BPS-17	45,000	50,000	90,000	144,000
PPS-8	BPS-18	50,000	75,000	125,000	200,000
PPS-9	BPS-19	75,000	90,000	175,000	280,000
PPS-10	BPS-20	100,000	118,000	250,000	400,000
PPS-11	BPS-21	125,000	150,000	350,000	560,000
PPS-12	BPS-22	150,000	200,000	500,000	800,000

Contd.P/2.

3. All other terms and conditions will remain the same as contained in earlier instructions of Finance Department's O.Ms No.FD(SR-III)5-29/2008 (A), dated 16.02.2009 and No.FD(SR-III)5-29/2008 (A) dated 11.03.2010.



(SHAKEEL AHMED)

DEPUTY SECRETARY (SR-I)

for Secretary to Government of Sindh

NO.SO (SR-III)5-29/2008(A)

Karachi, dated the 21st September, 2017

A copy is forwarded for information & necessary action to:-

1. The Accountant General Sindh, Karachi.
2. The Director General Audit, Karachi.
3. All Treasury Officer (including District Accounts Officer) in Sindh.
4. All Officer in Finance Department, Government of Sindh, Karachi,
5. All Head of Autonomous Bodies in Sindh.
6. The Director Audit and Accounts (Inspection), Finance Department,
7. The Director Local Fund Audit, Sindh, Karachi.
8. The Budget and Accounts Officer, Forest Department, Govt. of Sindh, Karachi.
9. The Incharge (Website), Finance Department, Govt. of Sindh, Karachi.
10. The Director of Information, Government of Sindh, Karachi.

He is requested to give wide publicity through all news media.



(HABIB-UL-ISLAM)

SECTION OFFICER (SR-III)

for Secretary to Government of Sindh

NO.SO (SR-III)5-29/2008(A)

Karachi, dated the 21st September, 2017

A copy is forwarded for information to:

1. The Section Officer (R-14), Govt. of Pakistan, Finance Division (Regulation Wing), Islamabad, with reference to his O.M. No.F.4(9)-R-14/2008, dated 19th July, 2017.
2. The Secretary to Govt. of the Punjab, Finance Department, Lahore.
3. The Secretary to Govt. of Khyberpakhtunkhaw, Finance Department, Peshawar.
4. The Secretary to Govt. of Baluchistan, Finance Department, Quetta.
5. The Secretary to Govt. of Azad Government of the State of Jammue and Kashmir, Finance Department, Muzaffarabad.
6. Office order file.



(HABIB-UL-ISLAM)

SECTION OFFICER (SR-III)

for Secretary to Government of Sindh

**GOVERNMENT OF PAKISTAN
FINANCE DIVISION
(Regulations Wing)**

No. F. 4(9) R-14/2008

Islamabad, the 19th July, 2017


OFFICE MEMORANDUM

Subject: STANDARD PAY PACKAGE FOR THE PROJECT STAFF DIRECTLY RECRUITED FOR DEVELOPMENT PROJECTS FUNDED FROM PSDP.

The undersigned is directed to refer to this Division's O.M. No.F.4(9) R-3/2008-592/09, dated 18th August, 2009 and to state that revised Standard Pay Package for officers/staff directly recruited from open market on contract basis, for the execution of Development Projects funded from PSDP will be as follows:-

Project Pay Scale (PPS)	Regular BPS	Minimum (Rs.)	Increment @ 5% of the Minimum	Maximum (Rs.)
PPS-1	BPS 1-4	16,000	800	25,600
PPS-2	BPS 5-8	20,000	1,000	33,000
PPS-3	BPS 9-10	25,000	1,250	40,000
PPS-4	BPS 11-13	30,000	1,500	48,000
PPS-5	BPS 14-15	40,000	2,000	64,000
PPS-6	BPS 16	60,000	3,000	96,000
PPS-7	BPS 17	90,000	4,500	144,000
PPS-8	BPS 18	125,000	6,250	200,000
PPS-9	BPS 19	175,000	8,750	280,000
PPS-10	BPS 20	250,000	12,500	400,000
PPS-11	BPS 21	350,000	17,500	560,000
PPS-12	BPS 22	500,000	25,000	800,000

2. The aforesaid pay package will be effective from 01-07-2017 for the new as well as the on-going PSDP projects and shall be admissible subject to the following conditions:-

- 
- i) This pay package will be followed for the appointments of officers/staff including Project Directors, Advisors, Specialists, Consultants etc. in the PSDP funded development projects as reflected in the PC-I/PC-II, duly approved by the competent forum. Based on the sensitivity and size of the project, the CDWP shall decide on whether the Project Director is to be placed in PPS-10 or PPS-11 or PPS-12.
 - ii) The above lump sum pay package will be admissible for fresh/direct /existing employees of PSDP Projects. However, pay of the fresh/direct employees shall be fixed at the initial stage and thereafter an annual increase @ 5% of the initial stage would be admissible.
 - iii) The pay of the existing PSDP funded projects employees shall be fixed to the next higher stage of the revised stage of the above pay package.

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From pre-page

- iv) Annual increment to the Project employees in Standard Pay Package shall be admissible on completion of one year continuous service from the date of appointment on the relevant post and also in the subsequent years in the same manner.
- v) The above lump sum project pay package shall not in any way be less than the minimum rates of wages as revised from time to time.
- vi) Government employees may apply for project posts. However, if any Government employee is selected on a project post, he/she will have to resign from Government service before appointment on project post.
- vii) The relevant project approving fora like CDWP or ECNEC will decide the number and pay scale of project staff.
- viii) Adoption to Standard Pay Package-2017 shall require revision/ approval of PC-1 from the competent forum.
- ix) The Projects employees will be appointed on contract basis in PSDP projects for an initial period not exceeding two years which will be extendable further till the completion period of the project on yearly basis after evaluation of their performance.
- x) No additional facility, in addition to the revised Standard Pay Package, shall be admissible for PSDP Projects' employees.
- xi) This pay package shall not be admissible to those who are re-employed/appointed on contract after their retirement. They may be allowed pay and allowances, as per provisions of the contract policy of the Establishment Division issued vide their O.M. No.F.10/52/95-R-2, dated 18th July, 1996 and as amended from time to time.
- xii) Those retired Government servants who compete with others from the private sector for appointments against projects positions on the basis of open competition and are selected on merit should be entitled to the package, perks and privileges laid down for that positions in the projects according to the clarification issued through Establishment Division's O.M.No.10/67/2004-R-2, dated 21-06-2005 or as revised from time to time.
- xiii) The project employees appointed through transfer (deputation) on full time basis will get pay in their own pay scales and allowances plus deputation allowance as admissible under the deputation policy contained in Establishment Division's O.M.No.1/13/87/R-I, dated 03-12-1990 as amended from time to time, at the rate of 20% of the basic pay subject to maximum Rs.12,000/- per month or as revised from time to time.
- xiv) The officers/ officials granted additional charge of the posts of projects in addition to their own duties will be entitled to draw additional charge allowance @ 20% of the basic pay, in addition to their own pay/allowances of their regular posts subject to maximum Rs.12,000/- per month or as revised from time to time.

From pre-page

- xv) This pay package will not be admissible to those project employees whose services/posts are transferred to the non-development side after completion of the project, from the date of their transfer.
- xvi) The payment of pay package of project staff will be stopped from the date of transfer of their service/posts to any other establishment.
- xvii) On transfer of project posts to the non-development side, such posts shall be filled in the prescribed manner in regular Basic Pay Scale and incumbents of such posts shall be treated as fresh employees of the Ministries/ Divisions/ Departments and not for the projects.
- xviii) If an employee of the project is selected on a post of the non-development side, he will be appointed at the initial stage of the relevant Basic Pay Scale, and his pay and service rendered in the project shall not be protected/counted for any purpose i.e. pay, pension and seniority etc.

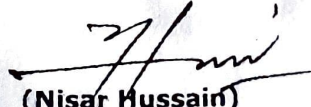
2. The earlier instructions contained in Finance Division's O. Ms. No. F.4 (9) R-3/2008-592/09, dated 18th August, 2009, No. F. 4(9) R-3/2008-396/2011, dated 12th December, 2011 and No. F. 4(9) R-3/2008, dated 08th July, 2013, No. F. 4(9) R-3/2008, dated 3rd November, 2016 stand superseded and replaced by this Office Memorandum.


(Nisar Hussain)
Section Officer (R-14)
Tele: 9245873

All Ministries/Divisions/Departments:

Copy also forwarded for information to:-

1. President's Secretariat (Public), Islamabad.
2. President's Secretariat (Personal), Islamabad.
3. Prime Minister's Office (Internal), Islamabad.
4. Prime Minister's Office (Public), Islamabad.
5. National Assembly Secretariat, Islamabad.
6. Senate Secretariat, Islamabad.
7. Election Commission of Pakistan, Islamabad.
8. Supreme Court of Pakistan, Islamabad.
9. Federal Shariat Court, Islamabad.
10. Islamabad High Court, Islamabad.
11. Auditor General of Pakistan, Islamabad.
12. Controller General of Accounts, Islamabad.
13. AGPR, Islamabad/Lahore/Peshawar/Karachi/Quetta.
14. Military Accountant General, Rawalpindi.
15. All Financial Advisors/Deputy Financial Advisors attached to Ministries/Divisions etc. and all officers of Finance Division.
16. Chief Accounts Officer, M/o Foreign Affairs, Islamabad.
17. Financial Adviser and Chief Accounts Officer, Pakistan Railway, Lahore.
18. All Chief Secretaries/Finance Secretaries of the Govt. of Punjab/ Sindh/ Khyber Pakhtunkhwa/ Balochistan/ Azad State of Jammu & Kashmir and Gilgit Baltistan.
19. Capital Development Authority, Islamabad.
20. Office of the Chief Commissioner, Islamabad.
21. Federal Public Service Commission F-5/1, Agha Khan Road, Islamabad.
22. Secretary, Wafaqi Mohtasib (Ombudsman)'s Secretariat, Islamabad.
23. Pakistan Atomic Energy Commission, Islamabad.
24. Central Directorate of National Savings, Islamabad.
25. National Accountability Bureau, Islamabad.
26. Member (Finance), KRL, P.O. Box No.1384, Islamabad.
27. Intelligence Bureau, Islamabad.
28. Pakistan Mint, Lahore.
29. Director General Post Office, Islamabad.
30. Secretariat Training Institute, Islamabad.
31. Directorate General of Inspection & Training, Custom & Central Excise, 8th Floor, New Custom House, Karachi.
32. Earthquake Reconstruction & Rehabilitation Authority (ERRA), Prime Minister's Office (Public), Islamabad.
33. Federal Tax Ombudsman's Secretariat, Islamabad.
34. Web Administrator, Finance Division, Islamabad for uploading at Finance Division's website (i.e. www.finance.gov.pk).


(Nisar Hussain)
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