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"ACCESS TO FINANCIAL SERVICES (PRIME)"
BMZ NO.: 2017 70 064
KFW PROCUREMENT NUMBER 506 966

QUALITY ASSURANCE FRAMEWORK

MEMBER OF GOPA CONSULTING GROUP

"ACCESS TO FINANCIAL SERVICES (PMIC SOLAR)"

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QUALITY ASSURANCE FRAMEWORK

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Contents

List of Figures

Abbreviations

A	Amps (or Ampere)
a.c.	Alternating Current
Ah	Amp Hours
CB-SHS	Component Based Solar Home Systems
CSF	Credit Support Facility
d.c.	Direct Current
GoP	Government of Pakistan
HH	Households
HP	Horse Power
ICT	Information and Communication Technologies
IEA	International Energy Agency's
kW	Kilo Watts
KfW	German Development Bank
LV	Low Voltage
MPPT	Maximum Power Point Tracker
MFI	Microfinance Institution
MFP	Microfinance Provider
PMIC	Pakistan Microfinance Investment Company
PCU	Project Coordination Unit
PSH	Peak Sun-Hours
PWM	Pulse Width Modulated
SHS	Solar Home System
SIPs	Solar Irrigation Pumps
V	Volt
VFD	Variable Frequency Drive
VA	Volt Amps
W	Watts
Wh	Watt Hours
W_p	Watts Peak

Definitions

Applying Company:
Company applying for qualification under PRIME program

Qualified Company:
Company approved in accordance with the requirements of this Quality Assurance Framework under PRIME program

1. Introduction

This is the Quality Assurance Framework to be met by a business operating in Pakistan to become a Qualified Company eligible to provide VeraSol verified solar products[1] and component-based solar home systems under the PRIME program to promote the deployment of quality-verified solar home solutions.

The following different type of systems included in the program:

i. Plug & Play SHS Kits (PNP-SHS) up to 350Wp;
ii. Component Based Solar Home System (CB-SHS);
    - DC Solar Home System up to 500Wp;
    - AC Solar System up to 5000Wp for housing and Productive-use appliances;
    - Solar Irrigation Pumping solutions for water pumps up to 10HP;

Note: *The Quality Assurance Framework is targeting VeraSol verified solar products and components to be installed in component based solar home systems up to 5000W_p (array rating), 5000Wp (array rating) for housing and Productive use appliances and solarization of Irrigation pumps up to 10HP through the financing facility provided by PMIC to its partner MFPs.*

This document includes the

- company requirements;
- products standards;
- installer requirements;
- process and application for a company to apply to become a Qualified Company and to have their products and installers approved; and
- complaints and sanctioning procedures.

The complete Quality Assurance Framework also includes three guidelines that must be followed when designing and installing the CB-SHS and SIPs. These guidelines are titled:

- CB -SHS DC Solar Home System- Design Guidelines for maximum array size 500 Wp;
- CB -SHS AC Solar Home System- Installation Guidelines for maximum array size 5000 Wp.
- Minimum technical standards for solar irrigation pumps that covers design qualifications and technical specifications for Solar Irrigation Pumping Solutions

2. Qualified Company Requirements

This section details the criteria to be met by a business operating in Pakistan to become a Qualified Company eligible to provide VeraSol verified solar products, component-based solar

[1] www.VeraSol.org

home systems and Solar Irrigation Pumps under the PRIME program to promote the deployment of quality-verified solar solutions for households and small businesses.

This section describes the process required for an Applying Company to be technically approved to apply to PMIC for qualification under PRIME program. This process requires the completion of an application form, and this information must provide all the evidence to meet the criteria as detailed in this document.

2.1 Business Registration

Applying Company is officially registered with Federal Board of Revenue (FBR) Pakistan, or his business is registered with Pakistan Tax Network and has a valid NTN.

2.2 Management Capability

The Applying Company must nominate at least one person who will be the contact person for PMIC. This person will take responsibility for the company meeting all the requirements specified in this document and be the person formally authorised to answer any questions regarding the application.

The Applying Company shall provide organisational details of their business to show where this person is positioned within the existing management structure and to include the name and position of at least one alternate contact person.

2.3 Operation Structure

The company shall provide a description of their operation. This shall include:

- Company has at least 02 years' experience distribution and installation of solar PV products, Joint ventures or Consortium are also eligible.
- Number of staff and the breakdown of how many in management, administrative, sales and technicians.
- List of projects or system installations for which they have previously supplied solar equipment and/or list the number of solar products provided under previous programs or sold directly to end customers.
- Description of environmental code of practice, including used battery disposal.
- Listing all their regional outlets; retailers, distributors; and
- Information on their staff who will deal with MFP's staff.
- Implementation of an electronic waste (e-waste) management procedure, in particular a strategy for used battery disposal. As a minimum the e-waste management procedure will ensure safe collection and safe disposal or recycling of the provided system components once they are no longer in use. In this context safe means that there are no detrimental effects to human beings or to the environment during the stated procedures.

3. Company Technical Requirements

3.1 VeraSol Plug and play DC solar products

Qualified company shall only provide products according to VeraSol quality standards (to be tested and certified in accordance with IEC/TS 62257-9-5 & 8)[2], additional requirements apply for components that are not dealt with in the named standards (in particular fans).

3.2 Components used in Component-based Solar Home Systems and Solar Irrigation Pumps

Qualified company shall only use components within their Component-based solar home systems:

- that have been tested and verified against the required standards or technical specifications that are specified in Section 4; and
- also meet the product performance requirements that are specified in Section 4.

The Applying Company shall provide (For DC plug and play VeraSol products only):

- a list of all the different brands/models of VeraSol verified products
- provide brochures for the different products and models of VeraSol verified products
- provide the test certificates/reports from a testing laboratory accredited to ISO/IEC 17025 **General Requirements for the Competence of Testing and Calibration Laboratories** verifying that the product meets the specified standard.
- Provide if any, agreement/ purchase order/ dealership/ MoU executed with the supplier/manufacturing for VeraSol verified products.
- Standard timeline to supply different products after placement of purchase order by MFP.
- Product warranty/replacement terms
- If imported, provide products evidence/ assurance of custom clearance.
- If a new model is released by a manufacturer, then that model shall also be specified on a test certificate and the Qualified company must provide that test certificate to PMIC for verification before the product is supplied or installed.

If the applying company intends to supply DC Solar CB-SHS or plug and plug and play SHS packaged with locally manufactured solar products, then they shall:

- provide one complete Solar CB-SHS as per offered/required specification for testing from **NED University, Karachi or University of Engineering Technology (UET) Lahore,** the testing cost will also be paid by the company. The Program shall also

[2] https://VeraSol.org/solutions/quality-standards

get ONE random sample from each company for testing during program or when required by the Technical Advisor and PIC, the testing cost will be paid by the Program.

Note: Qualified company shall provide the certificate of conformity (CoC) and Pre-shipment inspection (PSI) as per the requirements stipulated in SRO 604 (1)/2019 issued by an accredited agency within the country of origin by an accredited agency in accordance with the requirements of ISO/IEC 17065 to their partner MFP before installation of plug and play, CB-SHS and SIPs for all imported products.

3.3 Design of Systems for CB-SHS and SIPs

Approved Companies shall design their systems in accordance with the requirements of the "*Solar Home System Design Guidelines*" in annexure A and design guidelines provided in 'Technical standards for SIPs'.

Qualified Company shall provide designs of their systems for approval of technical committee. These DC CB-SHS systems shall have solar arrays in the range from 160W_p to 500 Wp and AC CB-SHS systems shall have an array size of 501W_p to 5000W_p. Solar solutions for irrigation pump up to 10Hp motor size is recommended. The purpose of providing these designs is to verify that the systems being designed by the companies are in accordance to the "*Solar Home System Design Guidelines*" and guidelines provided in the 'Technical standards for SIPs. Further verification will be undertaken when systems are randomly inspected (see section-5 flow chart).

Overall system design and configuration (i.e. the interplay of individual system components) is then evaluated by the Technical Committee to confirm the appropriate balance between energy generation and storage capability of the system, and the correct sizing of system components in relation to each other is assessed in order to assure energy output performance and longevity of the product over time. Finally, a *guaranteed system energy output* the solar system can deliver is calculated based on its configuration.

If a solar system is found to be fully compliant with the Program's Quality Charter requirements, all product characteristics are recorded in a Datasheet and the Qualified Company receives a Certification Letter/email for the specific solar system design. Datasheet records all approved components and system configuration characteristics of the Quality approved solar system. It also contains a unique identification number for the Quality approved product design i.e. Product Verification Number [PRIMEPV#). The Product Datasheet forms the basis for later quality control activities in the field.

RE Experts, Credit officers and Independent Verification agent (IVA) in the field would manage the provided data sheets and related product verification numbers.

3.4 Installation of Systems

VeraSol verified plug and play solar products do not require a technician to install whereas the Qualified Company employ or sub-contract installers responsible for the installation of CB-SHS and solar irrigation pumps. The Qualified company is responsible for the installations and troubleshooting of the supplied systems. Solar Installers shall install CB-SHS and solar solutions to run Irrigation pumps in accordance with the *Installation Guidelines* in annexure B and C. and "Product data sheet" approved by Technical Committee. A testing and commissioning sheet approved by Technical Committee shall also be provided with every system installation. The information required in the testing and commissioning sheet is the minimum that shall be included in any test certificate developed by a Qualified Company.

The Qualified Company's employ or sub-contract installers responsible for the installation of component-based solar home systems and Solar Irrigation Pumps (SIPs) supplied by the Qualified Companies approved to finance CB-SHS & SIPs through MFPs under PRIME program must comply with the requirements listed in 3.4.2.

3.4.1 Installers hired by Qualified Company

Qualified company shall hire installers that qualify the qualification criteria mentioned in the below section 3.4.2. Qualified company shall submit installer's qualification document with their partner MFP before installation of systems.

Blueprint model

A blueprint model will be adopted to train the qualified Installers of the solar companies. Hands-on training of installers in Punjab and Sindh province in selected districts will be carried out by an experienced and qualified Installer hired by the PMIC. A dummy installation of CB-SHS & SIP will be done in MFI office, or any other central location provided by the MFIs and installers will be trained and asked to follow the standard installation procedures. Training module for installation will be developed by the Technical Committee.

3.4.2 Installer Qualification and Experience Requirements for Extra Voltage system installations

For an installer with systems having system voltage equal to 50VDC and above, the installer shall meet the following pathway:

- been a solar home system installer for a minimum of two years;
- holds the Vocational training certificate/Dipoma provided by the any recognized authority;

  or
- Undertaken and passed a solar training conducted by PMIC/Program Implementation Consultant

4. Technical Standards Requirements

4.1 VeraSol verified DC products

Qualified companies shall offer the following product types:

4.1.1 Pico-PV (Solar lantern and simple multi-light systems)

Pico-PV[3] that have been quality-certified by VeraSol or been designed in accordance with IEC/TS 62257-9-5 & 8 and tested in accordance with IEC/TS 62257-9-5 & 8. The Pico-PV Quality Standards[4] and an up-to-date database[5] of products that meet the Standards are available on the VeraSol's official website.

4.1.2 Plug & play Solar Home System Kits

PNP-SHS that include DC appliances such as fan that have been quality-certified by VeraSol or been designed in accordance with IEC/TS 62257-9-5 & 8 and tested in accordance with IEC/TS 62257-9-5 & 8.

[3] A PicoPV system is defined as a small **PV**-system with a power output of 1 to 10W, mainly used for lighting

[4] https://VeraSol.org/solutions/quality-standards

[5] https://data.VeraSol.org/products/sek?verified=true&sortBy=date-product-listing-was-last-updated-mm-dd-yyyy_desc

4.1.3 Minimum requirements VeraSol Plug and play solar products, plug and play SHS kits and appliances:

Category	Minimum Specifications	Minimum Performance	Remarks
Lighting	• System includes at least three (3) fixed light points intended for indoor use. • Cables connecting light points to other system components must be at least 5 m in length	After one day of solar charging, system capable of providing at least 1680 lumen-hours per solar day of lighting service (when used in combination with DC fan and smartphone charging)	Daily energy services estimated based on daily solar insolation of 5 kWh/m^2, according to test methods specified in IEC TS 62257-9-5 & 8.
Ventilation	System includes at least one (1) DC fan with oscillating mode.	After one day of solar charging, system capable of powering DC pedestal, table or ceiling fan for at least 8 hours per day (when used in combination with lighting and smartphone charging) • Minimum air delivery rates for DC fans: • **Pedestal**: 2.6 m3/min/W +/- 5% • **Ceiling**: 3.83 m3/min/W +/- 5%	DC fan combination solar run time and air flow measured while in oscillating mode.
Mobile Phone Charging	System capable of charging common models of basic mobile phones and smartphones.	After one day of solar charging, system capable of charging at least one smartphone per day (when used in combination with lighting and ventilation)	Smartphone energy demand assumed to be 5.7 Wh.

***** Companies may offer SHS kit bundled with either DC fan

* Batteries used in all LG certified products are either lead-acid or lithium-ferrous-phosphate (LFP) type

* The PV module mounting system is required for SHS kits with solar module power of 50 Wp or higher.

4.2 DC Component based solar home systems

The individual system components used in component-based solar home systems by the Qualified Companies must comply with the specific component standards listed in this document.

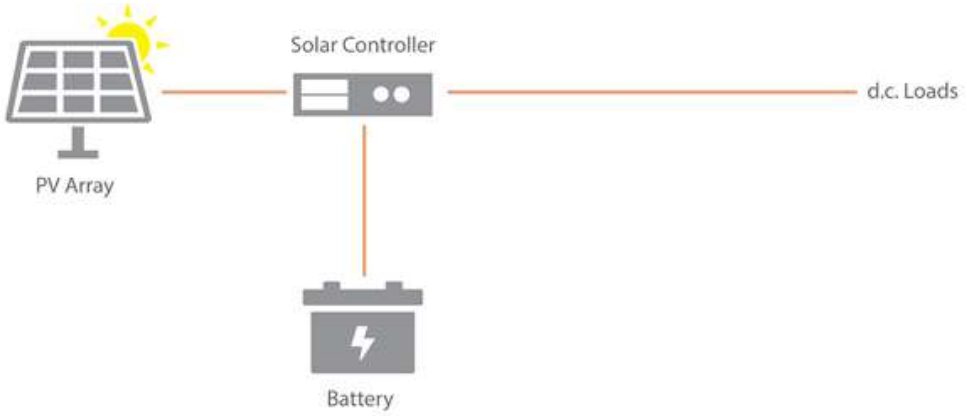


Figure 1 Example of a simple DC component based solar home system

Details of items for sample DC Solar PV System

S/No.	Items/description	Quantity
1	Solar Panel, 150Wp or above, A Grade	1
2	Charge Controller, 15 Amps PWM/MPPT	1
3	Enclosure Box for battery and charge controller	1
4	Mounting Structure	1
5	LED lights 5W – 12W (local) 3w -7w (Imported)	3
6	DC Celling or pedestal fan	1
7	Battery, 55Ah-12V @10H – Maintenance free and Lead Acid flooded batteries	1
8	Misc. Accessories, Breakers, fuses, jacks, clamps, ducts, switches, cables, nut bolts, enclosure box stand, bulb cover (only for outer bulbs)	1 lot
9	Installation and logistics	1 Job

*Solar panel size may vary from 150Wp to 200 Wp. Companies may use the most appropriate solar panel size as per the requirement of the end user. The minimum solar panel requirement for running a load of two dc fans and 4-5 led lights is 350 watts with PWM charge controller. The solar panel requirement can be less with MPPT charge controller.

4.3 Specifications of Individual components for DC Solar PV System

4.3.1 PV Module

Parameters	Min. Specifications required
Module	Brand shall be verifiable
PV Module model No	Verifiable
PV Module Capacity	150Wp and above
PV Module Type	Mono/Polycrystalline Cell
Quality	A Grade
Efficiency	≥ 16% or higher for Poly
Power Tolerance	Must be +3 or more
Operating Temperature	–40 oC to +85oC
Temperature Coefficient	–0.43%/ o C or less
Certification	Compliance against IEC 61215, IEC 61730
Make	Frame Must Withstand 3600 PA Load
Junction Box	IP 65/IP 66
Cable	Frame Must Withstand 3600 PA Load
Connectors	MC4 or comparable
Performance guarantee	25 years

4.3.2 Charge controller

Parameters	Min. Specifications required
Continuous Output	DC Load
Capacity	Min 15 Amps
Type	PWM type (3 stage charging)
Output Voltage Range	As per design
DC input rating	250 Watts DC or above
Battery Application	12V / 24 V DC (as per string design)
Protections	Short Circuiting Surge Protection PV reverse polarity protection Over charging voltage (Battery)
Operating temperature Humidity	0 to 45oC. 10 ~ 90%RH
Alarm	Alarm on major fault. Auto restart after 10 sec of major fault.
Display and storage data	Display on LCD with controller buttons. 6 month or more data storage with easy access through USB or equalling
Performance guarantee	2 years - Display on LCD with controller buttons. 6 month or more data storage with easy access through USB or equalling
Certification	Compliance against IEC 62109, IEC 62509, IEC 62093

4.3.3 Battery

a. Sealed Lead Acid – SLA battery and flooded batteries

Parameters	Minimum specifications required
Battery Make. Performance guarantee 3 Years Replacement Warranty 18 months or more Brands Renowned and Verifiable	Shall be verifiable
Battery Type	AGM/Gel/OPzS/OPzV/Flooded
Battery Capacity (Ah)	55 Ah- 200 Ah 12 V @ 10hr discharge or better
Battery Life	~700 - 800 @ 50% DoD, 3~10 HR discharge
Self-Discharge	The maximum permissible self-discharge rate is maximum 4% percent of rated capacity per month at 25°C, certified compliance of EN 60896-21
Relief Valves	Self-regulating pressure relief valve
Operating temperature	-15o C ~ 45oC (Be within 2% of the operating time up to max. 50°)
Batteries tested and certified	Compliance with all applicable standards that may include IEC60896-21/22, ISO9001(TUV), DIN43539-T5, IEC61427, DIN40742-773-774, DIN 40736, CE, TL, Storage Standard GB/T 22473
Manufacturing Date	Max. four Months (Evidence required)

b. Lithium batteries (LiFePO4)

- Cycle life of the **LiFePO4** battery (12V) before 80% capacity of initial capacity shall be minimum 3000 cycles @ 50% depth of discharge at discharge rate of 10 hours.
- The **LiFePO4** battery must have battery management system (BMS) to ensure battery safety and reliability.
- The **LiFePO4** battery shall have LED status and alarm indication.
- The charge and discharge rate of the battery shall be designed at .2C minimum but capable of handling .5C charge and discharge currents.

4.3.4 Cabling

1. All exposed wiring (with the possible exception of the module interconnects) must be covered in conduits/duct. Wiring through roofing, walls and other structures must be protected through the use of bushings. Wiring through roofing must form a waterproof seal (applicable for wiring only)
2. For conduit and duct flexible PVC material with ½ inch size must be used
3. Field-installed wiring must be joined using terminal strips or screw connectors. Soldering or crimping in the field must be avoided if possible. Wire nuts are not allowed.

The rated current carrying capacity of the joint must not be less than the circuit current rating. All connections must be made in junction boxes. Fittings for lights, switches, and polarity sensitive socket outlets may be used as junction boxes where practical.

4. All wiring shall be colour coded and/or labelled.
5. Installation including wiring shall meet the requirement and recommendations given in 8.3 of IEC 62124 ed 1
6. No conduit or fitting shall be attached directly to thatch or any other non-supportive surface.
7. Especially avoid installing the conduit direct over the roof; there must be distance not less than 1 inch between the roof surface and conduit/duct.
8. Cables must be joined using junction boxes, screw-connectors, and block connectors.
9. All wires must be terminated with proper end sleeves and wire thimbles with different colours for positive and negative polarity.
10. Field installed wiring must be joined using terminal strips or screw connectors. Soldering or crimping in the field must be avoided if possible. Wire nuts are not allowed.
11. The rated current carrying capacity of the joint must not be less than the circuit current rating.
12. Fittings for PV, lights and battery must be with polarity sensitive socket outlets to avoid short circuiting.

Cable specifications are as followed

Parameter	Requirement
PV to battery box / controller'	4mm2 or higher, 99.99% pure copper (Stranded and flexible) Make sure that the voltage drop at end node shall not be more than 2%
Charge Controller to Battery	6mm2 or higher, 99.99% pure copper (Stranded and flexible) Make sure that the voltage drop at end node shall not be more than 2%
Battery box/ controller to Load	76/.076 or higher, 99.99% pure copper (Stranded and flexible) for DC fan (for distance must not be more than 6 meters) 40/0.76 or higher for LED light USB standard cable for mobile charging (2 sets) Make sure that the voltage drop at end node shall not be more than 2%

Electric board must have following switches

a. Switches and circuit breaker

S/No.	Description	Qty
1	USB for mobile phone charging	1
2	Mobile, LED ON/OFF	1
3	Fan(1 for each type of fan) ON/OFF	2
4	Lights (On/Off)	5
5	Circuit breaker	1

Note:

1. Circuit Breaker Voltage rating must be greater than the maximum circuit voltage and current rating must be between 125% - 150% of the maximum design current for the circuit
2. Switches must have a clear visual indication of their state (ON/OFF or I/O)

4.3.5 PV Mounting Structure (pole or roof mounted)

Description	Requirement
Structure material	Mild steel
Material Gauge	Gauge 14 or better
Wind loading	Mounting system shall be able to allow air circulation for cooling in high temperature and withstand wind speed of 100 Km/hour at 3 sec gust
Adjustable mounting structure	Angle adjustment between 14o to 25 o
Material surface protection	Mounting structure shall be Galvanized not less than 80 microns in case of hot dip & 30 microns in case of electroplating.
Operation and maintenance	Structure shall be accessible for personnel to allow regular cleaning of the solar module

4.3.6 LED Lights

Description	Requirement
Rod/ Blub Type	Aluminium or Ceramic casing (must have better heat dissipation)
Watts	12Watts or less with lux output not less than 370 on Gonio Photometer
CRI	75 or better
System efficiency	75 lumens/watt or better at nominal. Be designed for lumen maintenance of L70 or 70% at the end of useful life at ambient temperature of 35 deg C
Input voltage	+/- 25 tolerance% of rated voltage
Color Temperature	5000-6500 K
Working temperature range	-10°C to +55°C

Life Time	20,000 Hours or more
Beam angle	120 Degrees
Lens/cover	Frosted
Photometric	Light fittings must be marked with the manufacturer, model number, rated operating voltage, rated current and date of manufacture or batch number
Test Reports form Manufacturers (recommended)	Punjab Energy Efficiency & Conservation Agency (PEECA) specifications

4.3.7 DC Fan

To qualify, DC fan must have gone through the following test procedures for the evaluation of product performance from **ETML lab at PSQCR, Lahore.**

- A procedure for measuring air delivery, power input, and energy efficiency value adapted from IEC 60879:1986: Performance and Construction of Electric Circulating Fans and Regulators;
- A procedure for evaluating drop resistance and physical ingress protection adapted from IEC TS 62257-9-5:2013: Recommendations for small renewable energy and hybrid systems for rural electrification – Part 9-6: Integrated system – Selection of stand-alone lighting kits for rural electrification.
- A procedure for inspecting fan blades and guards adapted from IEC 60335-2-80: Household and similar electrical appliances. Safety. Particular requirements for fans.

Minimum service value for DC fans

- **Pedestal**: 2.6 m3/min/W +/- 5%
- **Ceiling**: 3.83 m3/min/W +/- 5%

Warranty: 2 years

4.4 AC Component based solar home systems

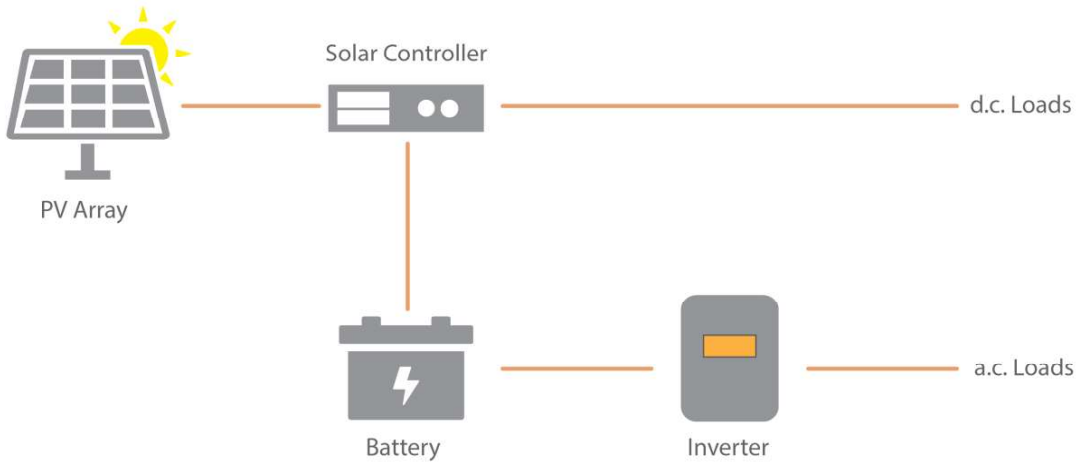


Figure 2 Example of a simple AC component based solar home system

4.4.1 Solar Modules

For Solar Home Systems with an array Peak Watt Rating Greater than 100Wp

Imported Solar modules with a peak power rating greater than 100Wp shall meet either the relevant following design qualification and type approval standards

- IEC 61215 Terrestrial photovoltaic (PV) modules - Design qualification and type approval

and

- IEC 61730 Photovoltaic (PV) module safety qualification

OR

at least comply with the above standards. Conformity testing to be done in the labs of NED University, Karachi or University of Engineering and Technology (UET) Lahore to ensure that the components comply with the above-mentioned IEC standards.

Each module shall be marked with a serial number with the purpose of providing traceability to the manufacturer's name, factory, and date of manufacture.

The module label must show the correct Certifier Mark (logo) corresponding to that on the test certificate supplied at the time of approval.

If the certificate/test report on which the listing was based becomes invalid, then the Qualified company must supply a new certificate for the module or cease using that in the systems supplied under PRIME program.

4.4.2 Inverters

The inverters shall meet one of the following two options:

1. IEC 62109 Safety of power converters for use in photovoltaic power systems
    - IEC 62109-1 Part 1: General requirements
    - IEC 62109-2 Part 2: Particular requirements for inverters
    - IEC 61683
    - IEC 62116
    - IEC 61727
2. UL Standard 1741: Standard for Inverter, converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources

The inverters shall be rated to provide an a.c. voltage within the range of 220V and 240V

In addition to meeting the requirements of the above referenced standards, each inverter shall be marked with a serial number with the purpose of providing traceability to the manufacturer name, factory and date of manufacture.

Batteries

Please refer to chapter 4.3.3 for technical specifications of batteries under CB-DC-SHS.

Charge Controller

All Inverters of 1.2kw, 2.2kw, 3.3kw and 5kw consists of built-in MPPT charge controllers. All imported charge controllers shall have to comply with IEC 62109, IEC 62509, IEC 62093.

4.5 Solar Irrigation pumping solutions for existing water pumps

PMIC shall allow lending loans for solar solutions aimed at running the Irrigation pumps. These loans shall only be provided for replacing the diesel-powered pumps and electrifying the existing electric tube wells up to 10 HP with solar as **source of energy**.

Additional requirements for Solar Irrigation Pumping

1. Financing of solar irrigation pumps to be allowed only in;
    - areas of relative groundwater abundance, where water tables are shallow, but ironically, most farmers use expensive diesel pumps due to lack of electricity infrastructure. This zone covers Interior Sindh and some parts of Punjab and KP.
    - areas of diverse geography where combined use of surface and groundwater is common. These areas include Punjab and Sindh Provinces in Pakistan.
2. The water pump may be surface mounted/submersible. Both AC & DC pumps are eligible.
3. Gross Head shall not be more than 100 feet for bore hole and dug well.
4. Before supply and delivery of the pumps, details for matching required specifications shall be provided to Pakistan Microfinance Investment Company (PMIC) for approval.

5. The water shall be used mainly for irrigation purpose.
6. The sizes of Water Pumps to be solarized are 5.5HP, 7.5HP and 10HP.

The Solar Irrigation Pumping solutions comprises of PV Modules/Array with appropriate voltage and current level to operate the water pump, a controller/VFD unit and Balance of Systems. Solar Modules quality standards would remain the same as described in section 4.4.1.

Pumping Inverter/Variable Frequency Drive (VFD)

- Controller may be of VFD/Fixed frequency operated;
- The controller may have MPPT technology;
- Voltage Ratings: 200 +/- V 15% and 400 +/- 15% V
- Rated output voltage: 3 Phase 380 VAC
- Test/Compliance standards: IEC 61899-3, IEC 61800-5-1, IEC 61800-5-2
- The maximum allowable restarting time must be less than 120 seconds;
- It is recommended that the pump shall not start below 70 % of the rated voltage of motor;
- Controller having a minimum protection of IP20 may be allowed if it is enclosed by a controller box having a minimum protection of IP40. If the controller itself has an IP 41 protection, then no control box will be necessary;
- The controller should have short circuit and overload protection;
- Controller must have a minimum efficiency of 90 % at rated frequency;

4.6 Testing Laboratories

VeraSol verified products

Companies shall offer only products that have been quality-verified by laboratories listed on VeraSol's website[6]. Eligible products must meet the applicable Lighting Global/VeraSol Quality Standards through testing according to IEC TS 62257-9-5 & 8 at an ISO 17025 accredited laboratory listed on VeraSol official website.

Component-based solar home systems

Qualified Company will provide documentary evidence of testing and IEC certification of all **imported** system components and conformance test reports for all locally manufactured system components tested in accordance with the technical specifications mentioned in chapter 4.3 and 4.4 by a testing laboratory accredited to ISO/IEC 17025 **General Requirements for the Competence of Testing and Calibration Laboratories**.

Copies of all the relevant ISO 17025 accreditation certificates or compliance/conformance test reports and other supporting documentation from the test laboratory may be provided to PMIC at the time of product qualification.

Company will provide one complete DC Solar PV system consisting of **locally manufactured components** as per offered/required specification for testing at **NED University, Karachi or University of Engineering and Technology (UET) Lahore,** the testing cost will be paid by the company. The Project shall also get ONE random sample from each company for testing during project or when required by the Technical Committee (TC), the testing cost will also be paid by the company.

List of tests is given below

Test name	No. of samples	Duration
PV Modules		
Visual Inspection Test	1	1 day
Flash test	1	1 day
Electroluminescence Test	1	1 day
Battery		
Battery capacity test	1	1 day
Charge controller		
Functionality verification test	1	1 day
Led bulb		
Photometric Measurements	1	1 day
Cables/wires		

[6] https://storage.googleapis.com/VeraSol-assets/VeraSol-Test-lab-Factsheet-Nov-2022.pdf

Strand Diameter (mm)	2	2 days
Overall Diameter (mm)		
Insulation Thickness (mm)		
DC resistance at 20oC (Ω/1000m)		
Insulation Resistance @ 70oC (MΩkm)		
High Voltage 2kV for 5 min		
Fan		
Air delivery, power input, and energy efficiency value		3 days
Drop test		

As part of the component approval process, the Applying Company is required to provide test certificates and conformance test reports to demonstrate that the major components used in the system complies with the relevant specified standards.

Qualified company have to comply with the below safety requirements as stated below

Earthing Protection

A minimum of one separate dedicated and interconnected earth electrode must be used for the earthing of the solar PV system support structure with a total earth resistance not exceeding 5 ohms as below.

a. Equipment earth (DC)

Equipment earth (DC) shall be checked for proper earthing. Equipment earth (DC): All metallic parts of DG Facility such as PV modules, DCDB, generator, iron clad Switches will be connected to earth with two separate and distinct earth connections to Avoid any loss of property or Human being.

Lightning protection

Facility is separately grounded and the lightning arrestors are provided. The Lightening Arrester need to be provided for the buildings which are of more than 15 meters height only.

4.7 Warranty

VeraSol Plug and play solar products: 2 years replacement warranty for Pico solar products and 2 years warranty for solar home kits.
AC/DC Component based solar home system and Solar Irrigation Pumps: One-year comprehensive repair and maintenance warranty at site (free of cost) shall be provided for all system components.

The photovoltaic modules shall be warranted to provide their rated output at standard conditions within ±10% for a minimum of 10 years under the operating conditions at the sites.

The modules shall be warranted against physical defects for a period of at least 5 years following installation.

The battery, solar controller (PWM or MPPT) and inverter shall each have a minimum 1-year comprehensive warranty.

Pumping Controller: 1 year warranty)**.** Pumping system performance warranty.

The responsibility to carry and honour these warranty provisions is borne by the Qualified Company and applies even if the product manufacturer fails to honour the warranty and/or the company manufacturing the product no longer exists.

5. Company

5.1 Application Process

A company applying to be eligible to apply for PRIME program shall complete the Company Application Form provided in below section. This form is divided into 2parts:

- Part 1: General Information
- Part 2: Component Documentation for imported Plug and play products and DC solar systems consisting of locally manufactured solar components.

All the information requested in this form must be provided with the application

The form is provided as a Word document and an applicant must submit the application in the same order as shown on the form and must respond to all questions in each section.

Part 1: shall be completed and provided either as a separate document or included in the first pages of a submission document that includes all the evidence and documents requested in Parts 1 through to 2

Part 2: Supply the test certificates required to prove that their products meet the required standards and a statement on the warranty of the components.

The application shall be submitted electronically and by post. The electronic version can either be provided on a memory stick or via email.

The application shall be submitted to:

Head of Sector Development
Pakistan Microfinance Investment Company
e-mail: saqib.siddiqui@pmic.pk
Tel: +92 51 84 87 820
Ufone Tower, Blue Área
Islamabad, Pakistan

5.2 Processing by PMIC

Once an application by an Applying Company to be technically approved for eligibility to supply Plug and play products, CB-SHS and SIPs to MFPs has been received, the PMIC shall provide the application to its Technical Committee within 2 working days of receiving the application. The Technical Committee will complete the verification checklist as per qualification criteria mentioned in the relevant section. The verification process involves:

1. Confirming that the application form is complete
2. Confirming that all the components: solar modules, batteries, solar controllers and inverters meet requirements.
3. Confirming that the Applying Company is able to design systems in accordance with the design guidelines.
4. Confirming the Applying Company's contact person has been specified.
5. Confirming that the Applying company has provided information on their operation.

Each review will take between 1 to 2 days to process subject to the number of applications submitted to the PRIME Technical Committee. The Committee shall undertake the review and submit the verification checklist within 5 to 10 working days after receiving a completed application.

The checklist includes an area for stating why a company was not yet eligible and what needs to be done to rectify the situation.

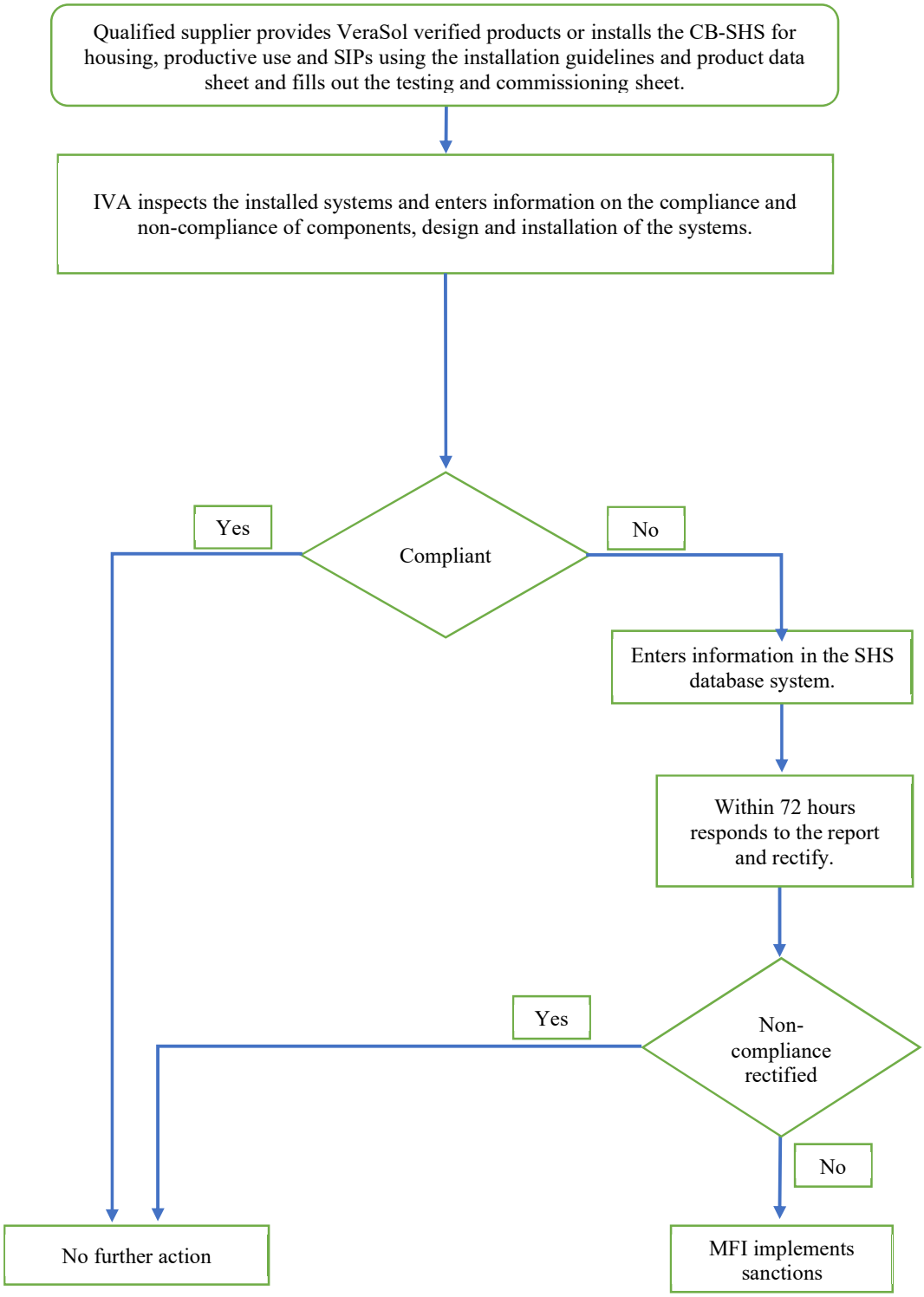
5.3 Inspection of Systems

PMIC shall hire a Third part firm as an Independent Verification Agent (IVA) to carry out 100% verification on installed products. PMIC with the support of IVA shall be responsible to conduct on-site monitoring visits on 100% installations whereas large-scale Technical Audits for products on-site at customer households/premises/farm will also be conducted by the Program Implementation Consultant (PIC) to verify that installed products are compliant with the VeraSol technical specification sheets/certificates, and "Product datasheet" and "*CB-SHS & SIP Installation Guidelines*" for CB-SHS and SIPs (including customer service delivery for Quality Approved CB-SHS and SIPs).

Brochures and certificates for VeraSol verified products/components used in CB-SHS/SIPs and testing and commissioning sheets for CB-SHS and SIPs shall be entered in the Field monitoring system after each installation by the Qualified Company. Independent Verification Agent (IVA) shall inspect the systems entered in the SHS Database system and provide approvals.

If the system has part(s) of the installation that are non-compliant, IVA shall enter the information in the system which will be viewed by Qualified Company. The Qualified Company will then have a period of 72 hours to respond to the complaint and state how they intend to rectify the non-compliance(s). If the Qualified Company fails to respond or fails to rectify, the non-compliances will result in the MFI implementing the sanctioning procedure as specified in below figure.

This process as described above is shown in the flowchart as below.



5.4 Sanctioning Procedure

Section-5.3 describes the inspection process. The procedure detailed is to be followed when an inspection report is entered by IVA and viewed by a Qualified Company and they either fail to respond or fail to rectify the non-compliance.

- If the Qualified Company fails to respond to the inspection report after two weeks, PMIC through their RE Expert shall attempt to contact the Qualified Company by phone and/or electronically to determine why there has not been a response?

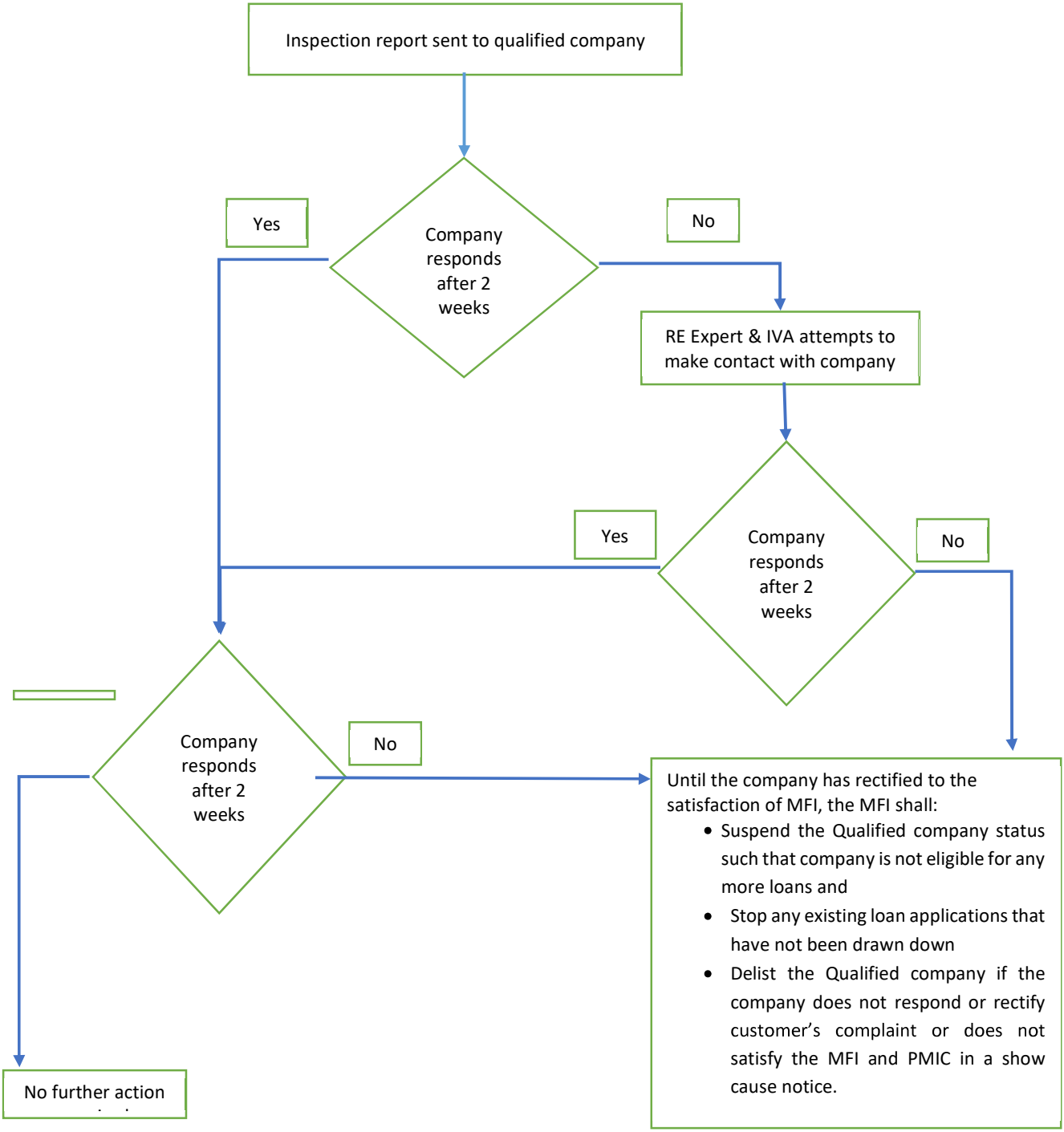
- If, after contact has been made with the Qualified Company and the Qualified Company still fails to respond within two weeks of being contacted/notified then MFI upon advice of respective RE Expert (PMIC), MFP shall remove or suspend the Qualified Company status such that the company is not eligible for supplying systems on PRIME program and retain all his pending payments till the time issue gets resolved.

- If the Qualified Company does respond and the system has been rectified to the satisfaction of the PMIC's RE Expert/IVA then no further action is required.

- If the Qualified Company does respond and has not rectified the non-compliance to the satisfaction of the IVA and PMIC's RE Expert, then, until the company has rectified to the satisfaction of the PMIC, the MFI shall:
    - Suspend the Qualified Company status such that the company is not eligible for any more loans; and
    - Stop any existing loan applications that have not been drawn down
    - Even then if the qualified company does not respond or rectify the non-compliance within the given time period then MFI will issue a proceeding by filing a written complaint against a qualified company with PMIC.
    - Upon verification of the existence of grounds for delisting, the PMIC shall immediately notify the qualified company concerned in writing, advising him that: a) a complaint for delisting has been filed against him, or they have been considered by the PMIC for delisting, stating the grounds for such; b) they have the opportunity to show cause why he shall not be delisted; c) a hearing shall be conducted before the PMIC, upon their request, where they may present documentary evidence, verbal testimony and cross-examine the witnesses presented against them; and d) the consequences of being delisted. Within five (5) calendar days from receipt of notification, the qualifying company shall submit its written answer with documentary evidence to PMIC with a manifestation for request of hearing to determine questions of fact, if he so desires. No time extension shall be allowed. Shall the qualifying company fails to answer within the same period, the PMIC shall advise all partner MFIs

participating in PRIME to delist the qualifying company and also issue a resolution recommending to their Head of the Procuring Entity the immediate delisting of the qualifying company from participating in any bidding process of the company.

The flow chart below summarises the above process



5.5 Customer Service Best Practice Guideline

The Customer Service Best Practice Guidelines detail the actions, activities and procedures that a Qualified Company shall apply to provide customers with quality service. These include:

a) When MFI client enquires about potential services to be provided, the Qualified Company shall respond in a professional manner and as quickly as practically possible;

b) If a site visit is undertaken, the Qualified Company's staff or their installer shall undertake a thorough site visit as per the requirements detailed in the System Design Guideline;

c) When providing a quotation to a potential customer, the Qualified Company shall provide (as a minimum) the following information:
   - Full specifications of the system equipment being offered including quantity, make (manufacturer) and model number;
   - The relevant warranty information relating to each of the items of equipment;
   - The expected output (daily) of the system and how it meets the electrical energy requirements of the customer (e.g. a completed load assessment form);
   - Firm quotations which include all equipment, installation and commissioning charges.

d) When designing a system, the Qualified Company's designer shall follow the Solar Home System and SIP Design Guidelines;

e) When installing a system, the Qualified Company's installer shall follow the Solar Home System Installation Guidelines;

f) For system installation, the Qualified Company shall provide the customer with a minimum of 1 years' warranty on the installation workmanship;

g) A Qualified Company shall provide support to the customer when a product underperforms or fails under warranty;

h) A Qualified Company shall keep, as a minimum, the documentation relating to the system installed as specified in the relevant technical guidelines;

i) If a customer complains to a Qualified Company that the system has failed:
   i. If the failure occurs within the 1 year' installation workmanship warranty period, the company:
      - Shall respond to the complaint within 72 hours;
      - If it is a fault arising from the installation workmanship, it is the Qualified Company's responsibility to rectify the problem by correcting, repairing or replacing the faulty items/ accessories or installation;
      - If it is an equipment fault, it is the Qualified Company's responsibility to rectify the problem by correcting, repairing or replacing the faulty

items/ accessories or installation;

ii. If the failure is after the 1 year installation warranty period:

- Qualified Company shall still provide paid back-up service to the customer and must respond to the complaint in a timely manner;
- This response shall initially involve attempting to determine the fault remotely and then, if required, to organise a visit to the system to determine the fault and then to rectify the fault as soon as possible. A reasonable price shall be quoted to the customer for the call-out; that is the price shall be reflective of the price quoted for other work and not be higher that standard pricing because the customer has a problem with their system and needs help;
- If it is a fault in the installation's workmanship, the Qualified Company shall provide the customer with a quotation for repairs, re-installation or replacement of smaller items or accessories.

j) If it is a fault in the equipment, the Qualified Company shall fix the product as soon as possible. The cost in providing the repairs will be quoted to the customer. If the equipment is still under warranty, the cost shall just be for the time spent travelling to/from site and onsite while undertaking the replacement (or repairs) of equipment unless this will be paid by the manufacturer. Qualified company shall use their best endeavours to solve all complaints, in case of disagreement the endeavours can be checked, and it can be determined if that was sufficient;

k) The Qualified Company shall inform the respective RE Expert and MFP after rectifying the customer's complaint;

l) If the Qualified Company does not respond within the agreed time or does not rectify the complaint to the satisfaction of the customer, then the RE Expert will inform the focal person designated by the qualified company to resolve the complaint within 72 hours. Even then if the complaint is not rectified, RE Expert will advise the MFI to take the following steps until the supplier has rectified to the satisfaction of the customer and RE Expert:

i. Suspend the Qualified Company status such that the supplier is not eligible for any more loans; and

ii. Stop any existing loan applications that have not been drawn down;

iii. the Qualified company if the supplier does not respond or rectify customer's complaint or does not satisfy the MFI and PMIC in a show cause notice.

m) A Qualified Company shall not criticise the work of another Qualified Company directly;

n) If a system inspection is undertaken of the work of a Qualified Company, the Qualified Company shall respond to any reasonable request by the RE Expert to fulfil his or her duties.

5.6 Application Form

General Information of Company

Company APPLICATION FORM	
Part 1: General Information on Company	
Name of Company	
Physical Address of Main Office/Shop	
Postal Address (if different)	
Website	
Name of Contact	
Position	
E-mail	
Phone	
Mobile Phone	
Name of Alternate Contact	
Position	
E-mail	
Phone	
Mobile Phone	
Information on the company management structure showing where the contact person is positioned is included with the application? (*please tick if yes, cross if no)*	
List any accreditation that company might have and the date of their expiry	
Information on their number of staff with a breakdown is included with the application (*please tick if yes, cross if no*)	
Information on their operation including number of outlets is included with the application (*please tick if yes, cross if no*)	

5.6.1 Undertaking/Declaration (To be given on Company's letterhead)

To,

The Head of Sector Development,
Pakistan Microfinance Investment Company,
Islamabad

Subject: Undertaking/Declaration

Dear Sir,

It is certified that I/we have read the Quality Assurance Framework and the related provisions/terms and conditions, and I/ we agree to abide by these guidelines and related terms and conditions. Failure to comply with these guidelines will result in disqualification from PRIME program.

This is to certify that the VeraSol verified products and various components of the PV module/ charge controller, inverter/VFD/ battery, electric wires etc. will conform to the relevant standards, as mentioned in the Quality Assurance Framework.

I also hereby declare that all information submitted in the application is true to the best of knowledge and belief. This is to confirm that in case of any dispute, the decision of PMIC will be final and binding on all.

Signature

Name & Designation of Authorized Signatory

[Print on company letterhead]

[Date]

Pakistan Microfinance Investment Company (PMIC)
21st Floor, Ufone Tower, 55 C,
Main Jinnah Avenue, Blue Area,
Islamabad 44000, Pakistan
Tel: (+92-51) 8487820-45

Subject: Letter of Interest – PMIC -KFW RE Initiative Through Microfinance (PRIME)

Dear Sir / Madam,

On behalf of [name of company] I would like to express our interest to participate in PRIME Program which we understand aims to support the financing of Solar home systems for households, solar solutions for small businesses and irrigation pumps in poor grid mostly peri-urban areas and off-grid locations in the rural areas of Pakistan.

At [name of company] we are involved in the distribution of solar based solutions to off-grid and poor grid households in Pakistan. We are very much interested in collaborating with PMIC and their partner MFPs in the implementation of this program.

Please do direct all correspondence related with PRIME program to the following individual(s):

Name:
Position:
Email:
Phone Number:

Sincerely,

Print on company letterhead]

[Date]

Pakistan Microfinance Investment Company (PMIC)
21st Floor, Ufone Tower, 55 C,
Main Jinnah Avenue, Blue Area,
Islamabad 44000, Pakistan
Tel: (+92-51) 8487820-45

Subject: Declaration regarding E-waste management plan

Dear Sir,

We declare that the procedures for the management of electronic waste generated from our solar system business shall be implemented. In particular, this will include the safe disposal or recycling of batteries and system components. The replacement of old Lithium-ion and lead acid batteries with new ones will not be done without collecting the former. We will collect the old batteries from the customer and safely dispose them off as per PMIC's proposed plan.

Sincerely,

CEO Director