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Subsidy Implementation Manual (SIM)

For the Department of Energy, PMB 9067, Port Vila, VANUATU

Ministry of Climate Change Adaptation, Meteorology & Geo-Hazards, Environment, Energy and Natural Disaster Management

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Abbreviations

A	Amps
AC	Alternating current
Ah	Ampere Hours
AS	Australian Standard
BMS	battery Management Systems
CE	Conform European
CEC	Clean Energy Council
DC	Direct current
DoE	Department of Energy
ECOP	Environmental Code of Practice
ELV	Extra Low Voltage (less than 120V DC)
EMP	Environmental Management Plan
EN	European Standard
HRC	High Rupture Current
Hrs	Hours
IA	Implementation Agency
IVA	Independent Verification Agent
IEC	International Electrotechnical Commission
ISO	International Standards Organisation
kWh	Kilowatt Hour
m	metre
mm	Millimetre
MPPT	Maximum Power Point Tracker
NABCEP	North America Board of Certified Electrical Practitioners
NZS	New Zealand Standard
OVR	Outport Verification Report
PIE	Project Implementation Entity
PPA	Pacific Power Association
PV	Photovoltaic
PWM	Pulse Width Modulated
RCD	Residual Current Device
SE4ALL	Sustainable Energy for All
SEIAPI	Sustainable Energy Industry Association of Pacific islands
SHS	Solar Home System
SIM	Subsidy Implementation Manual
UNELCO	Union Électrique du Vanuatu Limited
USA	United States of America
V	Volts
VAT	Value Added Tax
VCIR	Vanuatu Customs and Inland Revenue
VIPA	Vanuatu Investment Promotion Authority
VREP	Vanuatu Rural Electrification Project
VA	Verification Agent
VUI	Vanuatu Utilities and Infrastructure
VUV	Vanuatu VATU-
W	Watt
Wh	Watt hours

1. Background

The Republic of Vanuatu entered into the Pacific Region Infrastructure Facility ("PRIF") Grant Agreement with the International bank for Reconstruction and Development and the International Development Association (collectively, "World Bank") acting as administrator of PRIF dated December 4, 2014 ("First PRIF Grant Agreement"), pursuant to which the World Bank provided a grant (PRIF Grant No. TF018003) in an amount not to exceed four million seven hundred thousand United States Dollars ($4,700,000) ("First PRIF Grant") to assist in the financing of the Vanuatu Rural Electrification Project ("VREP I"). The objective of VREP I is to scale up access to electricity services for rural households, aid posts and community halls located in dispersed off-grid. VREP I is targeting 17,500 households, 2,000 community halls, and 230 aid posts. The Project commenced in 2015 and closed on September 30, 2020.

In 2017, the Republic of Vanuatu obtained additional grant funding from the PRIF, Scaling Up Renewable Energy Program in Low-Income Countries (SREP), and a loan and grant from World Bank's International Development Association IDA) to assist in financing VREP II. These funds are detailed below:

1. Pacific Region Infrastructure Facility (PRIF) Grant Agreement with the Association acting as administrator of the Pacific Region Infrastructure Facility dated July 23, 2017 ("Second PRIF Grant Agreement"), pursuant to which the Association provided a grant (PRIF Grant No. TFA5406) ("Second PRIF Grant") in an amount not to exceed three million four hundred and fifty thousand United States Dollars ($3,450,000);

2. Scaling Up Renewable Energy Program in Low-Income Countries (SREP) Grant Agreement with the Association acting as an implementing entity of the Scaling-up Renewable Energy Program under the Strategic Climate Fund dated July 23, 2017 ("SREP Grant Agreement") pursuant to which the Association provided a grant (SREP Grant No. TFA4979) ("SREP Grant") in the amount not to exceed six million seven hundred seventy thousand United States Dollars ($6,770,000); and

3. Financing Agreement with the International Development Association ("Association") dated July 23, 2017 ("Financing Agreement"), pursuant to which the Association provided a grant (Grant No. D1930-VU) in an amount not to exceed the equivalent of one million five hundred thousand Special Drawing Rights (SDR 1,500,000) ("IDA Grant") and a credit (Credit No. 6072-VU) in the amount equivalent to one million five hundred thousand Special Drawing Rights (SDR 1,500,000) ("IDA Credit").

The objective of the VREP II is to support increased penetration of renewable energy and increased access to electricity services in the dispersed off-grid areas of Vanuatu. The Project has three (3) components – Component 1 being provision

of solar home systems and micro grids systems in rural areas of Vanuatu. This component will support expansion of access to reliable electricity service in rural Vanuatu through SHS and micro grid configurations where mini grid configurations are unlikely to be economically viable and which are not earmarked for mini grids under this or other donor or government projects or are the least cost solution. SHS and micro grids will be available to rural households and public institutions. This component will target approximately 37 public institutions and 8,400 rural households, which equates to approximately 42,000 people.

Component 2 is the construction of Mini Grids systems in rural areas of Vanuatu. This component will support the expansion of access to reliable electricity services for rural communities through support for the design, supply, installation and commissioning of mini grid systems. The project will finance the construction of five (5) mini grids, based on initial cost estimates.

Component 3 is the technical assistance and project management. This component addresses three key areas of the project, the first focusing on the vendor registration model for Component 1, the second focusing on owners' engineer for Component 2 and the third focusing on project management. In addition, there is an allowance for Government contribution (US$1.5 million 'in kin'") that will cover the Government of Vanuatu's direct project related.

This final version of the SIM follows the culmination of the mid-term review. Under the review, the World Bank and DOE have agreed to extend the project, subject to approval of the World Bank Board, and to restructure the activities of VREP II Component i. Under the proposed changes, the vendor model that is described in the SIM will be concluded on 31st of December 2021 and the remaining funds will be channeled into procurement of solar systems to benefit rural public facilities to distribute benefit to rural Vanuatu communities.

2. Purpose and Definitions of this Manual

This Subsidy Implementation Manual (SIM) sets out the operation of the subsidy program whereby a Vendor supplies solar home systems and Micro Grid Systems for the VREP II.
Solar Home Systems and Micro Grid Systems eligible for Subsidy through VREP II must meet the product and installation specifications referred in the SIM.

The document describes:

- Criteria for Beneficiary Eligibility
- Criteria for being a Vendor
- Vendor Application Process
- Required Qualifications of Solar Technician and Electrical Technicians
- Responsibility of Vendor when selling a Solar Home System or Micro-Grid System.
- Why and how Vendors will be de-registered
- Criteria for Product to be included in Product Catalogue
- Product Application Process
- Why and how Products will be de-registered

- Product Catalogue
- Subsidy Re-imbursement Process
- Code of Conduct for Vendors
- Vendor Grievance procedure

- Grievance Procedure against a Vendor

and provides the following forms and checklists

- Vendor Application Form
- Vendor Application Checklist
- Product Application Forms
- Product Application Checklist
- Notification of Product Purchased Form
- Customer Declaration Form
- Sample Load Assessment Forms
- System Design Declaration
- Subsidy re-imbursement Application Form
- Subsidy re-imbursement checklist for DoE
- Subsidy re-imbursement checklist for VA
- Plug and Play SHS Test Certificate
- System Installation Inspection and Test Sheets
- DC Wiring Inspection and Test Certificate
- AC Wiring Inspection and Test Certificate

Definitions

The key definitions related to this project are the following:

Aid posts means village-based and operated nurses' aid centres.

Beneficiary means a Household, Public Institution or business located in dispersed off-grid areas eligible to receive a Subsidy for a Product in the Product Catalogue purchased from a registered Vendor for use in Household, Public Institution or business.

Category means the category set forth in the table in Section IV of Schedule 2 of the Financing Agreement.

Community hall means a non-for-profit- meeting place for community meetings, events, worship or other community related activities.

Department of Energy means the Recipient's Department of Energy, within the Ministry of Climate and Natural Disaster, or any successor thereto.

Environmental Code of Practice means the Recipient's Environmental Code of Practice (Used Batteries Disposal) for VREP II, as set out in the Project Operations Manual.

Electrical Technician is a person qualified to perform work on AC wiring systems.

Extra Low Voltage is less than 120V DC and less than 50V AC

Grievance Board is the Board established by the Vanuatu Government and the Utilities Regulatory Authority (URA) under a Memorandum of Understanding (MOU) to act as a grievance body to decide on grievances filed by vendors of Component 1 of VREP II. The Grievance Board consists of the CEO of the URA or his representative; Director General of the Ministry of Climate Change or his representative; and Director General of the Ministry of Finance and Economic Management or representative.

Household means all the people who occupy a housing unit and includes business activities being undertaken by the households. A house, an apartment or other group of rooms, or a single room, is regarded as a housing unit.

Independent Verification Agent and **IVA** means the agent appointed by the Department of Energy as provided for in Section I.D of Schedule 2 of the First PRIF Grant Agreement and Section I.B of Schedule 2 of the Finance Agreement.

Micro grids mean DC or AC grids connecting a small number of contiguous households or businesses providing mainly SE4ALL Tier 2 or 3 access to household electricity services, e.g. a school, staff quarters, local shop or a health centre, staff quarters with possibly some Tier 4 or 5 service e.g. for refrigeration in a health centre (AC with an inverter).

Output Verification Report means a report prepared by the VA, certifying that that a Vendor has made a sale of a Product in accordance with the Project Operations Manual and the Subsidy Implementation Manual.

Product means a larger SHS or SHS/Micro grids as listed in the Product Catalogue and defined in the SIM, and is eligible for a Subsidy under VREP II.

Product Catalogue means the catalogue of all eligible Products supplied by Vendors across all regions and island groups in order to present, transparently, to consumers the range of products available in their area and in the main centres and as amended from time to time.

Project Implementation Entity (PIE) means the entity implementing the project which in the case of the Vanuatu Rural Electrification Project is the Department of Energy (DoE).

Public Institution: Any government institution, such as a school, health facilities, and other community institutions such as churches, community centres and Community Halls.

Solar Home System (SHS) means a product category eligible for subsidies and describes a system consisting of PV-Panels, charge controllers, batteries and may also include an inverter, as defined in the SIM and

listed in the Product Catalogue and includes associated installation. The system size may be varied from time to time.

Solar Technician is a person qualified to perform work on Solar Home Systems with a system DC operating voltage at Extra Low Voltage (less than 120V DC).

Subsidy means the amount payable under a Subsidy Implementation Agreement to the Vendor for each Product provided by the Vendor to eligible Beneficiaries, calculated in accordance with the subsidy mechanism set forth in the Project Operations Manual and/or the Subsidy Implementation Manual, and verified by the Verification Agent; and "Subsidies" means more than one such Subsidy.

Subsidy Implementation Agreement means the agreement between the Recipient (Government of Vanuatu through DoE) and each Vendor setting forth the terms and conditions for participating under Component 1 of VREP II, as described in Section I. B. of Schedule 2 of the Financing Agreement for VREP II.

Subsidy Implementation Manual (SIM) means the document prepared and adopted by DoE setting forth detailed arrangements for implementation of Component 1 of VREP II, including eligibility criteria for beneficiaries and Vendors; the process for registration of Vendors; product registrations arrangements; arrangements for verification of Subsidy claims; a grievance mechanism, in form and substance satisfactory to the Association.

Verification Agent (VA) means the agent working with the Department of Energy who is undertaking the verifications as detailed in this SIM.

Vendor means a seller of a Product within the Recipient's territory that is registered as an authorized seller to sell such systems under the Project and has entered into a Subsidy Implementation Agreement with the Recipient.

3. Criteria for Beneficiary Eligibility

To be eligible to receive the Subsidy when purchasing a Product, the Beneficiary must:

1. Be the occupier of a Household where the product will be installed.
   or
   A representative of the Public Institution where the product will be installed.
   or
   A representative or owner of the Business where the product will be installed

2. Pay the cost of the Product less the Subsidy at time of purchase. The customer may agree on a payment plan to pay the cost of the Product less Subsidy with the Vendor. (Note for Products provided under VREP II Component I the cost of the Product will include the cost of installation for those installed by the Vendors
3. At the time of purchase or sign-up, sign and date a declaration form and Payment Plan Agreement stating
   a. That the system is to be used to provide lighting and other electrical services where relevant at the household/ business/public institution (include what is relevant)
   b. That the Vendor has fully explained the company's policy and the Product's warranty terms and has provided information on how to properly dispose of the used battery when purchasing a new one. (Note: Beneficiary only signs this part of form or Payment Plan Agreement if it is true)
4. Provide the Vendor with:
   a. For households:
      i. Name of Beneficiary; Mr/Mrs/ etc.
      ii. Name of head of household;
      iii. Sex of the head of household;
      iv. Address: Village and Island name and any other relevant details for locating the household
      v. Contact details: Preferably a mobile phone number
   b. For business or Public Institutions:
      i. Name of business or Public Institutions
      ii. Name of representative
      iii. Address: Village and Island name and any other relevant details for locating the aid post, community hall, business or Public Institutions
      iv. Contact details: Preferably a mobile phone number

5. Within the first 12 months, the Beneficiary must allow the Verification Agent (VA) contracted by the Department of Energy to verify that the system has been purchased and installed on the specified Housing Unit, or Business or Public Institution. This verification could be via phone contact or an actual site visit.

4. Criteria for Being a Vendor

This edition of the SIM is written to guide the four registered vendors as of August 2021 (E-tech, PCS, Energy4all and Savvy Solar) in the final 6 month operation of VREP until 31st December 2021. Those vendors have been registered in accordance to the rules and stipulations of the previous versions of the SIM. As such, the program will not register any new vendors. The vendor criteria are left within this version of the SIM as a reference point to DOE and the vendors of their responsibilities under VREP.

4.1 Registered Business

The Vendor must be a business registered by the Financial Services Commission or Office of the Registrar of Cooperatives & Business Development or Vanuatu Investment Promotion Authority (VIPA) and licensed by the Vanuatu Customs and Inland Revenue (VCIR) to operate within Vanuatu. It is preferred that the Vendor is able to prove a minimum of 3 years' operation. The application for a business having less than 3 years' operating experience will be processed, however the Vendor must provide a 3 years business plan for their complete business (solar and other activities).

If a foreign companies wish to participate in this program, the business entity must be registered in Vanuatu and have registered physical premises in Vanuatu from which the business will operate or select a local partner who will represent their company in Vanuatu. This partner must be a business registered by the Financial Services Commission, Office of the Registrar of Cooperatives & Business Development or VIPA to operate within Vanuatu. An agreement signed by both parties acknowledging that the Vanuatu company is the representative of the foreign company and all warranties of the products are assigned to the Vanuatu company. This must be submitted with Vendor applications.

4.2 Financial Capacity

The Vendor business must be financially solvent. The Vendor will be required to provide the business' financial statements for the last 3 years. For businesses of less than three (3) years of operations in Vanuatu, the vendor is required to provide DoE with evidence of its legal registration and to be accompanied by evidence of sufficient funds in its bank account, declaration of its liabilities or debts and projected financial statement for the next three (3) years based on its business.

4.3 Subsidy Implementation Agreement

Each Vendor shall have signed a Subsidy Implementation Agreement (SIA) with the Project Implementation Entity (PIE), the Department of Energy (DoE). This agreement shall require the Vendor to meet all the relevant Vendor related requirements detailed in the Subsidy Implementation Manual.

4.4 Business Plan

- The Vendor shall provide a business plan for the supply of eligible products within the VREP, which includes the following as a minimumThe name of the person who will be responsible to manage the program within the applicant's business and how participation in this program fits into the Vendor's current structure and business activities? An organisational chart of the applicant business should beprovided.
- What islands does the Vendor intend to target for the distribution of these products?
- Details on how the Vendor will distribute the eligible products to the various regions. This must include: listing all their own outlets/branches, any partnership agreements with other organisations, current and new dealers and/or details on any other method they will beusing.
- How the Vendors propose to market theirproducts?
- If the applicant Vendor already has products, which they will submit for product registration, and the maximum price of their products be for each of the Islands in which they will operate.. The maximum price will include the assembly of any control board, all required cabling and freight to the island but not the installation charge for the larger systems. For larger systems requiring installation an estimated installation charge for each Island should be provided separately. (Note FOB price will remain confidential)
- The Vendor's spare parts policy and how they will manage servicing the products in the outer islands.
- The process by which the Vendor will manage obtaining the customer's information and the receipt and declaration form or Payment Plan Agreement as required according to the subsidy re-imbursement and verification process. Note that this does not relieve the vendor of providing the details in the event that any part of the process fails.
- The Vendor's policy and procedure for complying with the Environmental Code of Practice and Battery Code ofConduct.
- The Vendor's grievance procedure as required by section 17. This procedure must include their returns policy and also how they will handle the replacement of products under warranty.
- For VREP II the vendor shall provide the following information:
    - Number of installation technicians?
    - Which of these installation technicians have:
        - an internationally recognised electrical license?
        - Certification from VUI or UNELCO
        - Clean Energy Council, Stand Alone Power System (SAPS) accreditation?
        - Pacific Power Association/Sustainable Energy Industry Association (PPA/SEIAPI) Off Grid installation certification level 2 or higher
        - Or any other appropriate qualifications and/or certification.

Sections 4.5 through to 4.10 describe in further detail the requirements that the vendor must satisfy and include within the business planNote: the registration of a vendor on the basis of a business plan does not relieve the Vendor of complying with the obligations under the project.

4.5 Management Capacity

The Vendor must nominate at least one person who will be directly responsible to manage the supply and associated support for the Vendor's eligible products.

The Vendor should provide organisational details of their business to show where this person is actually positioned within the existing business structure and to include the name and position of any other staff that will be responsible to deliver the services related to the eligible products.

The Vendor should include details and currency of any relevant accreditations (e.g. ISO9001 Quality Management), if any, that they hold.

4.6 Technical Experience in Solar

The applicant business must have previous experience in supplying solar home systems or micro-grids within Vanuatu or countries similar to Vanuatu having communities on remote islands or remote regions.

The Vendor must list those staff members who have relevant experience, summarise this experience with solar and what (if any) training they have had.

The Vendor should provide a 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.

The Vendor should provide the following details on three systems they have supplied and installed:

- The load assessment sheet that was used to determine the daily energy usage and if not available, the daily energy (Wh or kWh) that the system was designed to supply and explain how this was determined.
- The maximum demand in VA or kVA on the system.
- The rating of the solar array in Wp.
- The type (PWM or MPPT) and rating of solar controller used.
- The nominal DC voltage and capacity of the battery bank in Ah.
- The rating of the inverter in VA or W.
- Whether the system was supplied with a fuel generator and if so was the system designed for the generator to be used regularly.
- The irradiation values and source used in designing the size of the array.
- The days of autonomy and to what depth of discharge was used when determining the battery capacity.

4.7 Installer and Designer Qualifications for Vendors Providing Products for VREP II Component I

All systems that are being offered by a Vendor shall have been designed by a person with the following qualifications:

- Minimum PPA/SEIAPI Off-Grid Designer Certification Level II or
- Clean Energy Council (Australia) Stand Alone Power System Designer accreditation or
- North America Board of Certified Practitioners (NABCEP) certification

or
- Any similar internationally recognized qualification subject to approval by DoE.

Where the solar home system or micro-grid system being supplied under VREP II Component I it is required to be installed by the Vendor in accordance with the Subsidy Implementation Manual then at least one member of the installation staff shall have the following qualifications for the specific defined duties:

- For physical installation of the solar modules, controller, battery bank, inverter and associated Extra Low Voltage (ELV) DC wiring the solar technician shall have either
  - Minimum PPA/SEIAPI Off-Grid Installer Certification Level II or
  - Clean Energy Council (Australia) Stand Alone Power System Installation accreditation or
  - North America Board of Certified Practitioners (NABCEP) certification or
  - Any similar internationally recognized qualification subject to approval by DoE.
- For wiring from the inverter to the house, business or public institution's switchboard the electrical technician shall have either:
  - An electrician's license from another country (e.g. Fiji, Australia, New Zealand) or
  - Certified by Vanuatu Utilities & Infrastructure (VUI) to undertake electrical installations on houses connected to their networks or
  - Successfully completed all the following modules being offered by the Pacific Vocational Training Center in Port Vila:
    - Trade Literacy and Numeracy Skills
    - Electrical Wiring Safety
    - Workshop Craft Practice
    - Fundamentals of electricity
    - Single phase domestic electrical installations
    - Protection systems of electrical installations

4.8 Supply Chain

It is preferred that the Vendor already has a "supply chain" for the distribution and servicing of products to the outer Islands. This information should be provided in detail in the business plan.

The business plan shall include details of:

- The geographical areas proposed to be targeted under this program; and
- The distribution methods intended to be used through these areas.

If the applicant Vendor does not currently have a product supply chain, their application must include a detailed proposal of how a supply chain will be established and serviced.

4.9 Beneficiary's Grievance Procedure

The Vendor shall include in their business plan the procedure for dealing with Beneficiary's grievances.

If the grievance relates to a technical issue with an eligible product supplied under the program, the Vendor is required to prove they have a sound process to evaluate whether the technical problem is caused as a result of the customer's installation and usage of the product or whether a component (or components) within the system has failed.

The minimum requirement under these circumstances is that the Vendor should adopt the procedure as described in Section 17 of the SIM. The Vendor should at all times attempt to solve the grievance, but if this is not done, the vendor must advise the customer that they may submit their grievance directly to the Department of Energy.

At the time of applying for the subsidy reimbursement during this Program, the Vendor must provide a summary report of all Beneficiary' grievances during that period to show the nature and resolution of all customer complaints.

4.10 Environmental Code of Practice

Within the business plan the Vendor shall detail their policy and procedure on how they will comply with the Environmental Code of Practice for used battery disposal. In addition, the vendor shall provide information on Electrical Safety covering safe installation and use of electricity to every Beneficiary supplied with a product.

4.11 Products

A business can apply and become a Vendor without initially having a Product for the Product Catalogue. However, the Vendor may offer Products eligible for receiving a Subsidy program only when they have a Product listed in the Product Catalogue.

For a Vendor to be approved to provide Products and/or Micro Grid Systems under VREP II Component I the Products must meet the technical requirements listed in Section 8 of this document and the Vendor must provide all information required in the Product Application Form. It is only Products that meet the approval and verification process that will be included in the Product Catalogue.

Only Products, included in the Product Catalogue are eligible for a Subsidy when sold by the Vendor to a Beneficiary.

For those Products and Micro-Grids installed by the Vendor through VREP II Component I, only those systems which are installed in accordance to the installation guidelines referenced in Section 13 are eligible for a subsidy. If upon inspection the system installation is not in accordance the guidelines referenced on section 13 the Vendor must:

1) Rectify the installation to the requirements of the installation guidelines or
2) Repay the Subsidy.

For products installed by the Beneficiary under VREP II Component I the Beneficiary is entitled to a subsidy on the retail price of Products included in the Product Catalogue. The Vendor will then receive the balance outstanding through the subsidy via the mechanisms detailed in Section

15. Payment of Product selling price = X% of Product price paid by the Subsidy + (100-X)% of Product price paid to the Vendor by the Beneficiary.

For products and micro-grid systems installed by the Vendor under VREP II Component I the Beneficiary is entitled to a subsidy on the installation price of Products included in the Product Catalogue. The Vendor will then receive the balance outstanding through the subsidy via the mechanisms detailed in Section 15. Payment of Product installed price = X% of Product price paid by the Subsidy

+ (100-X)% of Product price paid to the Vendor by the Beneficiary.As part of the Vendor's application for product registration (and in business plan if applicable), the Vendor shall provide the maximum selling price proposed by the Vendor for the Products in the Islands in which the Vendor will operate. For products being supplied under VREP II Component I which is required to be installed by the Vendor in accordance with the Subsidy Implementation Manual the Vendor shall provide the approximate maximum cost for installing these products (separate to the product price requested above) in the various islands that they will supply products to and specify what is included in this installation price.

The DoE will keep this information to provide to the Verification Agent (VA) the next time that Vendor makes a claim for subsidy re-imbursement. During the verification process the prices on the invoices will be compared to the maximum prices provided by the Vendor in the form. There will also be a comparison of the serial numbers on the receipts and the serial numbers provided on the form.

4.12 Appropriate Manual for Beneficiary

Product supplied under VREP I

4.12.1 Product supplied under VREP II Component I

For every Product supplied by the Vendor that is listed in the Product Manual as a preassembled SHS kit that is to be installed by the Beneficiary the Vendor shall provide to the Beneficiary at the time of purchase a Beneficiary related product manual, which will describe the following and preferably with the aid of pictures:

- Copy of the load assessment sheet.
- How to correctly install the solar module so that it receives sun each day and is not shaded (this should be provided in local language).
- How to correctly install the control board or enclosure (this should be provided in local language).
- How to correctly install the battery (this should be provided in local language)
- How to interconnect the solar module, the control board or enclosure and the battery (this should be provided in local language).
- Installation checklist
- A description of the operation of the system and how to correctly use the system, particularly with respect to the hours of usage of each of the lights and other appliances (this should be provided in local language).
- Information on the safe use of electricity and electrical hazards (this should be provided in local language).

- List of equipment supplied.
- Shutdown and isolation procedure for emergency and maintenance.
- Maintenance procedure and timetable.
- Warranty information for the whole system and each item of equipment.
- System connection diagram.
- Equipment manufacturers documentation and handbooks for all equipment supplied.
- The Vendor's returns policy.
- How to dispose of the used battery when requiring a replacement and/or the process of how to return the used battery to the Vendor for recycling.
- Grievance redress process.

For Products and Micro-Grid systems installed by the Vendor that are listed in the Product Manual as eligible for subsidy under VREP II Component I, the Vendor shall provide to the Beneficiary at the time of purchase a Beneficiary related product manual, which include the following:

- Copy of the load assessment sheet.
- A description of the operation of the system and how to correctly use the system, particularly with respect to the hours of usage of each of the lights and other appliances (this should be provided in local language)
- Information on the safe use of electricity and electrical hazards (this should be provided in local language).
- List of equipment supplied.
- Shutdown and isolation procedure for emergency and maintenance.
- Maintenance procedure and timetable.
- Commissioning records and installation checklist.
- Warranty information for the whole system and each item of equipment.
- System connection diagram.Equipment manufacturers documentation and handbooks for all equipment supplied.
- The Vendor's returns policy.
- How to dispose of the used battery when requiring a replacement and/or the process of how to return the used battery to the Vendor for recycling.
- Grievance redress process.

Product Warranty for Products Provided Under VREP IThis section of the SIM is removed under Version 9. The section headings remain to assist reading of the document.

4.13

4.14 Product Warranty for Products and Micro-Grids Systems Provided Under VREP II Component I

The minimum warranty acceptable under this Program is 2 years on the complete system installation and on each of the individual items of equipment.

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 2 years warranty.

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

If a Vendor is de-registered for any reason, the Subsidy Implementation Agreement will legally require the Vendor's business to continue to honour the product warranty relating to all items sold within this subsidy program.

5. Vendor Registration Process

This section of the SIM is removed under Version 9. The section headings remain to assist reading of the document.

5.1 Application by Vendor

5.2 Processing Application by Department of Energy

6. Why and how Vendors will be de-registered

Vendors will be de-registered when:

a) Vendor continues to sell products under the scheme, which have been removed from the product list. In these circumstances, the subsidy would not be paid, but this would damage the integrity of the program.
b) The Vendor has acted fraudulently in the selling of the products and/or claiming of the subsidy.
c) The Vendor has been the subject of a grievance or a number of grievances, which indicates that the Vendor is not meeting the SIA and/or the Code of Conduct for Vendors.
d) The Vendors do not have the qualified staff as specified under Section 4.7 and they have products in the catalogue that are required to be installed by the Vendor.
e) If the Vendor is found to have installed a system, where upon inspection it is found to be electrically unsafe, exposed cables or terminals where Low Voltage is able to be touched, and the Vendor is proven to have been responsible.

The process for deregistering a vendor shall follow the grievance procedure as detailed in Section 18.

8. Criteria for Product and Micro-Grid Systems to be eligible for Inclusion in Product Catalogue for VREP II Component I

Solar Home Systems or micro-grid systems that are provided under VREP II Component I will comprise individual items of equipment (solar modules, battery, controller and inverter) assembled into a system. For the Solar Home system or micro-grid system to be eligible to be included in the Product Catalogue, each piece of equipment must comply with the specific equipment standards listed in section 8.2

As part of the product approval process the Vendor will be required to provide test certificates to demonstrate that the particular equipment complies with the relevant specified standard.

8.1 Technical Performance Requirements of Product

All Products and Micro-Grid systems approved to be in the Product Catalogue under the VREP II Component 1 must specify a daily energy output that the system can provide based on the design principles provided in the PPA/SEIAPI Guideline for the Design of Off Grid solar systems. The solar array shall be oversized by a minimum of 20% in accordance with the 2018 version of the PPA/SEIAPI Guideline for the Design of Off Grid solar systems.

When determining the daily energy output that will be specified in the Product Catalogue the following system data and efficiencies shall be utilised:

a For systems with Pulse Width Modulated (PWM) controllers:
   i Irradiation of 4.4 kWh/m^2
   ii Dirt loss of 5%
   iii Manufacturers Tolerance as specified on the solar module data sheet.
   iv Lead Acid Battery efficiency of 90% (columbic efficiency)
   v Lithium Ion Battery Efficiency of 95%
   vi Inverter efficiency of 95% (if applicable)

b For systems with a Maximum Power Point Tracker (MPPT) controller:
   i Irradiation of 4.4 kWh/m^2
   ii Dirt loss of 5%
   iii Manufacturers Tolerance as specified on the solar module data sheet.
   iv Temperature derating based on an ambient of 30 ^{o}C and the power temperature coefficient specified on the solar module data sheet.
   v MPPT efficiency of 95%

vi Lead Acid Battery efficiency of 80% (energy efficiency)
vii Lithium Ion Battery Efficiency of 95%
viii Voltage drop of 3%
ix Inverter efficiency of 95% (if applicable)

When determining the battery capacity for the system the following design parameters should be used:

a A minimum two days of autonomy is allowed for systems that are only supplying one specific appliance which is used during daylight hours and only on sunny days e.g. solar cooker.
b A minimum three days of autonomy is allowed for all other systems.
c The maximum depth of discharge at the end of the required days of autonomy shall be:
   I. 60% for lead acid batteries (12 V monobloc batteries)
   II. the maximum depth of discharge specified by the manufacturer for 2V lead acid batteries (typically 60 to 80%). If not specified, vendors are to use 80%.
   III. the maximum depth of discharge (or the maximum usable capacity) specified by the manufacturer for 12V Li-ion batteries

(Example: For 12V lead acid batteries providing loads of 120 watt hours per day then minimum battery capacity with 3 days autonomy down to 60% depth of discharge is (120 x 3)/(12 x 0.6) =50 amp-hours)

Batteries supplied with solar home systems shall have a minimum cycle life of 1100 cycles down to 50% depth of discharge.

Batteries supplied with micro-grid systems shall have a minimum cycle life of 2200 cycles down to 50% depth of discharge.

End of life is defined when the battery can only retain 80% of its original capacity.

8.2 Specific Equipment Standards

Quality products in the solar energy industry are typically tested and certified against standards developed by the International Electrotechnical Commission (IEC) or Underwriters Laboratory (UL) or in some cases European Standards (EN). Many products such as solar modules, batteries and sometimes inverters and controllers are tested and certified to both sets of standards. However, some USA manufactured inverters are tested against the UL standard for the USA versions and then have the CE (Conform European) marking meaning that they conform to European Requirements. As the industry has been progressing very quickly there are instances when some of the balance of system equipment used in the industry do not have IEC or UL standards available but other standard organisations like European Standards (EN) or specific country standards are developed.

8.2.1 Testing Laboratories

Testing and verification that the product has met the relevant standard shall be undertaken by a Testing Laboratory accredited to ISO/IEC 17025:**2017 General Requirements for the Competence of Testing and Calibration Laboratories.**

The test laboratory shall have accreditation for the particular standard relevant to the product being tested.

Prior to approving any product the DoE could request copies of all the relevant accreditation certifications from the Test laboratory.

8.2.2 Modules

Solar modules shall meet either

- One of the following design qualification and type approval standards
  - Clean Energy Council of Australia approval
  - IEC 61215 Crystalline silicon terrestrial photovoltaic (PV) modules—Design qualification and type approval
  - IEC 61646 Thin-film terrestrial photovoltaic (PV) modules—Design qualification and type approval

and

- IEC 61730 Photovoltaic (PV) module safety qualification
  - IEC61730-1 Part 1: Requirements for construction
  - IEC61730-2 Part 2: Requirements for testing

or

- UL Standard 1701: Flat Plat Photovoltaic Modules and Panels

For modules with IEC certification they must be certified as Application Class A per IEC 61730.

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 on which the listing was based becomes invalid then the Vendor must supply a new certificate for the module or cease using that module in the Product and the Product will be removed from the Product catalogue.

If a business wishes to sell modules that are manufactured by another company under their own brand name, then this business must obtain a co-licence certificate in their own name, which shows their own model numbers.

8.2.3 Module connectors

The connectors used to interconnect modules or to connect modules to other pieces of equipment shall meet the following standard:
EN50521 Connectors for photovoltaic systems—Safety requirements and tests

8.2.4 Batteries

Solar Home Systems
The batteries being supplied in a solar home system shall meet one of the following standards:

- IEC 61427 Secondary Cells and Batteries for Solar Photovoltaic Energy Systems - General Requirements and Methods of Test
- IEC 62619 Secondary cells and batteries containing alkaline or other non-acid electrolytes—Safety requirements for secondary lithium cells and batteries, for use in industrial applications
- IEC 60896 Stationary lead-acid batteries (series)
- UL 1973 Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
- UL1989 Standby Batteries
- UL 1642 Standard for Lithium Batteries

or

- A standard submitted by a Vendor that is approved by DoE

Micro-Grid Systems
The batteries being supplied in a micro-grid shall meet one of the following standards:

- IEC 61427 Secondary Cells and Batteries for Solar Photovoltaic Energy Systems - General Requirements and Methods of Test
- IEC 62619 Secondary cells and batteries containing alkaline or other non-acid electrolytes—Safety requirements for secondary lithium cells and batteries, for use in industrial applications
- UL 1973 Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
- UL 1642 Standard for Lithium Batteries

or

- A standard submitted by a Vendor that is approved by DoE

Requirements for Batteries supplied to either solar home systems or micro-grid systems

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

For lead acid type batteries only valve regulated sealed batteries shall be supplied. (That is wet batteries with liquid electrolyte are excluded).

Lithium Ion type batteries must be supplied with a manufacturer's approved Battery Management System (BMS)

8.2.5 Controllers

The controllers shall either meet one of the standards listed below or one of the markings listed below.

- IEC 62509 Battery charge controllers for photovoltaic systems - Performance and functioning
- IEC 62109 Safety of power converters for use in photovoltaic power systems
  - IEC 62109-1 Part 1: General requirements
- IEC60335: Household and similar electrical appliances - Safety –
  - Part 1: General requirements
  - Part 2-29: Particular requirements for battery chargers

- UL Standard 1741: Standard for Inverter, converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources

or

- A standard submitted by a Vendor that is approved by DoE

Markings include:

- Underwriters Laboratory (UL) Listing and Classification Mark
- Conformity European (CE) marking

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

8.2.6 Inverters

The inverters shall meet one of the following standards:

- 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
- UL Standard 1741: Standard for Inverter, converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources

or

- A standard submitted by a Vendor that is approved by DoE

Note: Some inverters manufactured in accordance with the UL standards will have the CE mark for their European (230V, 50Hz) models.

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

The inverters shall meet the requirements of simple isolation between the DC and AC. Isolation is provided by a transformer.

8.3 Micro-Grid System

Vendors can submit Micro-Grid Systems for the following four sizes of solar arrays:

a) **Micro Grid System Size One**: Solar Array of 2200W_p plus or minus 300 W_p. That is in range of 1900 W_p to 2500 W_p.
b) **Micro Grid System Size Two**: Solar Array of 3000W_p plus or minus 500 W_p. That is in range of 2500 W_p to 3500 W_p.
c) **Micro Grid System Size Three**: Solar Array of 4100W_p plus or minus 600 W_p. That is in range of 3500 W_p to 4700 W_p.
d) **Micro Grid System Size Four**: Solar Array of 5600W_p plus or minus 900 W_p. That is in range of 4700 W_p to 6500 W_p.

Systems can be offered with DC Output only, AC output only or both.

For each system offered the Vendor shall supply the following information to be included in the Product Catalogue:

1. The peak watt rating of the solar array
2. The DC battery voltage- Battery
3. The DC open circuit voltage of the array.
4. The capacity of the battery bank in Ah
5. Whether the output of the system is DC only, AC only or AC and DC.
6. What is the size of the inverters in Watts?
7. How many watthrs per day the system can provide based on type of controller and the system assumptions and efficiencies as provided in section 8.1.
8. The days of autonomy for the battery.
9. The minimum expected life of the battery in years.

8.4 System Sizes - Solar Home Systems (Products)

Vendors can submit solar home systems for the following four sizes of solar arrays:

a) **Solar Home System Size One**: Solar Array of 250W_p plus or minus 150 W_p. That is in range of 100 W_p to 400 W_p.
b) **Solar Home System Size Two**: Solar Array of 610W_p plus or minus 200 W_p. That is in range of 410 W_p to 810 W_p.

c) **Solar Home System Size Three**: Solar Array of 1050W_p plus or minus 240 W_p. That is in range of 810 W_p to 1290 W_p.
d) **Solar Home System Size Four**: Solar Array of 1600W_p plus or minus 300 W_p. That is in range of 1300 W_p to 1900 W_p.

Systems can be offered with DC Output only, AC output only or both.

Vendors may only offer 3 systems per each size category which must be within the rules stated above.

a) systems with different size modules within the same sized system
b) systems that are DC only and a system that is AC only and a system that includes both AC and DC outputs.
c) Systems with different days of autonomy in the battery
d) Systems with different quality of batteries

For solar home systems, the open circuit voltage of the specified array shall be less than 120V DC at a cell temperature of 15 degrees.

For each system offered the Vendor shall supply the following information to be included in the Product Catalogue:

1. The peak watt rating of the solar array
2. The DC system voltage- Battery and Solar
3. The capacity of the battery bank in Ah
4. Whether the output of the system is DC only, AC only or AC and DC.
5. What is the size of the inverters in Watts?
6. How many watthrs per day the system can provide based on type of controller and the system assumptions and efficiencies as provided in section 8.1.
7. The days of autonomy for the battery.
8.

8.5 Pre-assembled Solar Home Systems

Solar Home Systems can be supplied to Beneficiaries for their own installation if the following conditions are met:

a Systems can have a maximum of 2 PV modules. The PV array for pre-assembled systems must be configured and supplied such that there is a single solar array output cable which the beneficiary shall connect to the rest of the system.
b Systems can have a maximum of 2 batteries (lead acid) in series, or one battery pack (Lithium ion). Battery banks for pre-assembled systems must be configured and labelled to remove any possibility of the chance of

incorrect connection. The manual must provide instructions on how the battery bank is to be connected to the rest of the system by the beneficiary.

c The solar module(s) is provided with a solar array frame with clear instructions on how this is to be mounted.

d The solar module(s) is provided prewired with sufficient cable to reach the control board or enclosure and with cable mounting clips for clipping the solar module cable to walls, celling and roofs. The maximum voltage drop between the solar module and the controller shall be less than 3% and the current carrying capacity of the cable shall be rated minimum 1.25 times the short circuit current of the module.

e The battery is provided with a box or suitable enclosure that the battery will be mounted inside.

f For lead acid type batteries, the box/ enclosures shall have inlet and outlets vents sized in accordance with the formulas in the PPA/SEIAPI Off-Grid PV Power Systems- System Install Guidelines for the Installation. The battery box shall have inlet ventilation near the bottom of the enclosure and outlet near the top of the enclosure positioned so that there is air flow across the top of the battery. These can be located at the bottom on one side and near the top on the opposite side (refer Figure 4 in Section 13), however fumes rise so the top vent could be located in the top of the enclosure.. If the ventilation is on the front side (top and bottom) then the enclosure should have a sloping lid with the side of the ventilation being higher than the opposite side to allow the flow in at the bottom and over the battery and flow back out the top due the slope of the lid (refer Figure 5 in Section 13).

g For lithium ion type batteries, the box/enclosure shall be provided with sufficient ventilation to meet the manufactures'' cooling requirements for the battery.

h The fuses (or circuit breakers) for protecting the cables from the battery to the control board or enclosure shall be mounted either:
i) on the outside of the box/enclosure or
ii) within the box/enclosure at least 100 mm below the top of the battery.
Even though the batteries are in a box/enclosure they should have insulated covers for the terminals.

i For lithium ion type batteries, the BMS protection devices may meet the requirements for over-current protection of the output cables from the battery system where—
   i. the BMS includes over-current protection which is a readily available circuit-breaker or HRC fuse; and
   ii. the battery manufacturer's instructions permits the over-current protection of the BMS to meet the over-current protection of the battery outgoing cables.

j The fuses shall not be on the same side as the ventilation (for boxes with lead acid batteries) and if possible the top of the fuses should be 100mm below the top of the box.

k The fuses on the battery box should be prewired with the cable terminations located inside so that the Beneficiary only has to connect those cables to the battery terminals. The cables shall be black for negative and red for positive. There should be clear instructions on how to install the battery in the enclosure and connect the cables.

l The battery enclosure fuses shall be rated to protect all the cables in the preassembled system, that is solar module cables and inverter cable (if applicable). The fuses shall be rated to protect the cable in the pre- assembled system with the smallest diameter and hence lowest current carrying capability. However, the fuses must be rated to carry the maximum current required to meet the inverter loads, the dc loads (if applicable) and the maximum charge current to the batteries. If the fuses cannot protect all the cables in the pre-assembled system, then additional suitably rated protection devices (fuses or DC rated circuit breakers) shall be located for each cable at the end closest to the battery.

m If DC load cables are to be connected by the beneficiary to the pre- assembled solar home system, each of these cables shall be protected by a a protection devices (fuses or DC rated circuit breakers) mounted on the control board. The maximum rating of the protection device shall be 10A. These protection devices shall be connected between the solar controller load terminals and DC load output terminals. If the controller includes protection devices on the load side, rated maximum of 10A and protecting both the positive and negative cables then this will meet the requirement for protecting the cables supplying the DC loads.

n The solar controller, associated protection equipment and DC output connections (with protection devices) are all prewired and mounted on a control board or within an enclosure (not the battery enclosure).

o The cable to connect to the battery fuses shall be prewired and connected to the control board or enclosure. The cable shall have a current rating to meet the maximum demand current of the system. This would be based on the maximum power demand. The system shall be provided with cable clips for mounting the cables on the wall to provide mechanical support.

p If there is an inverter, it shall also be prewired on the DC side and mounted on the control board and provided with one or two general purpose outlets prewired and mounted on the control board or mounted on the outside of the enclosure. The GPO outlets shall be protected by a suitably rated double pole circuit breaker.

q The controller and inverter (if applicable) shall be installed in accordance with the installation specifications of the manufacturer (except for the variation for Class I inverters specified in clause r below) and in particular adhering to the requirements for ventilation of the two pieces of equipment.

r If the inverter has a Class I protection rating the inverter manufacturer will often require that the inverter casing be connected to a protective earth and possibly the installation of a residual current device (RCD) on the output circuits. The installation of an effective earthing system should be undertaken by an electrical technician. These preassembled systems are typically being installed by the beneficiary and the protective earthing system would not be installed. For the situation where the protective earth connection is unable to be installed then the inverter shall be installed within an enclosure, thereby providing extra protection from touch. The output power from the inverter shall be connected to a GPO mounted on the outside of the enclosure. As per clause p above, the GPO outlets shall be protected by a suitably rated double pole circuit breaker. If a protective earth is able to be installed than the double pole circuit breaker shall be replaced

by a Residual Current Device (RCD)with overcurrent protection. If RCD does not include overcurrent protection then an RCD in series with separate single pole circuit breaker for active cable will be required.

s With respect to wiring to the control board or enclosure the beneficiary only has to:
   i connect the cable supplying their DC loads to the specified output terminals on the control board or on the outside of the control board enclosure;
   ii use solar module connectors to connect the solar module to prewired connectors on the control board or on outside of enclosure;
   iii connect color coded cables (black for negative and red for positive) to the fuses on the outside of the battery enclosure.

t If the system contains lead acid type batteries, the system shall be supplied with a detailed instruction manual that specifies that nothing can be installed above the battery enclosure and a warning that even though the batteries are sealed they can still generate explosive hydrogen gas. The battery box should be supplied with a No Smoking Sign and Risk of Battery Explosion.

u Even when the system is installed by the system owner, in accordance with the instruction manual provided, it must still meet all the system installation requirements as specified in section 13 of theSIM.

v The control board and complete systems shall be tested and certified by an electrical technician as defined in section 4.7 of the SIM. This person shall sign a certificate that the system meets all the requirements as specified in this SIM and it is safe for a non-electrically trained Beneficiary to install. The test certificate is provided in section 35.

Note: DoE may require the provision of a complete sample system that will be independently inspected and tested by a suitably qualified electrician.

The vendor should encourage the Beneficiary who purchases a preassembled SHS kit to take digital photos of the installation and send them to the Vendor. The recommended photos should show:

- solar module mounted on the roof/pole;
- the array cabling on the roof and down the wall to the control board/enclosure.
- The control board orenclosure.
- The battery box including the warningsign
- The cabling between the battery bank and control board/enclosure

8.6 Solar Home Systems to be installed byVendor

Any system that requires the interconnecting wiring of the modules or the batteries onsite shall be installed by a suitably qualified technician.

It is preferred that the solar controller and inverter (if supplied) includes a prewired control board/enclosure that includes:

a The solar controller, associated protection equipment and DC output connections are all prewired and mounted on a control board or within an enclosure (not the battery enclosure).
b If there is an inverter and it is physically small enough , it should also be prewired on the DC side and mounted on the control board and provided with one or two general purpose outlets prewired and mounted on the control board or mounted on the outside of the enclosure. The GPO outlets shall be protected by a suitably rated Residual Current Device (RCD) with overcurrent protection. If RCD does not include overcurrent protection then an RCD in series with separate single pole circuit breaker for active cable will be required.
c A protective earth shall be installed to ensure that the RCD operates correctly.
d The controller and inverter (if applicable) shall be installed in accordance with the installation specifications of the manufacturer and in particular adhering to the requirements for ventilation of the two pieces of equipment.
e The control board and complete systems shall be tested and certified by an electrical technician as defined in section 4.7 of the SIM. This person shall sign a certificate that the system meets all the requirements as specified in this SIM and it is safe. A copy of the test certificate is provided in section 36.

Note:
If prewired control board/enclosures are being provided for a product then DoE may require the provision of a sample control board or enclosure that will be independently inspected and tested by a suitably qualified electrician.

If the prewired control board/enclosure is provided with an inverter and the only outlets of this inverter are power outlets supplied on the control board then the system can then be installed by a suitably qualified solar technician as defined in section 4.7. The solar technician shall install the protective earth.

For systems not provided with a prewired control board the complete systems shall be tested and certified after installation at site by an electrical technician as defined in section 4.7 of the SIM. This person shall sign a certificate that the system meets all the requirements as specified in this SIM and it is safe. A copy of the test certificate is provided in section 36. If the system includes an inverter then the system shall include the installation of a protective earth and the inclusion of an RCD and suitable overcurrent protection as required for the systems supplied with a prewired control board /enclosure.

The installation of the solar array and the batteries shall be in accordance with the requirements as specified in section 13 of the SIM.

8.7 Micro-Grid systems to be Installed by Vendor

The system shall be installed by a suitably qualified electrical technician as defined in section 4.7.

The installation of the solar array and the batteries shall be in accordance with the requirements as specified in section 13 of the SIM.

8.8 Approving Products

Products and Micro-Grid systems will be included in Product Catalogue if they meet the following approval procedure:

a all the information requested in the Product approval application form has been provided; and
b the output energy as specified is based on all the design assumptions provided in section 8.1 has been provided and is validated; and
c the battery days of autonomy has been specified and meets the requirements as specified in section 8.1.; and
d all the product test certificates as required in section 8 in accordance with the standards specified in section 8.2 have been provided; and
e all the product data sheets have been provided; and
f all the product warranties have been provided and al are a minimum of 2 years with the solar module being 10; and
g the test certificate (refer section 8.5) for the solar home systems being provided as preassembled SHS kit has been provided; and
h one of the solar home systems being provided as preassembled SHS kit has been supplied and independently inspected and tested by an independent electrician selected by DoE; and
i the test certificate (refer section 8.5) for the control board or enclosure has been provided for the solar home systems;
j if requested, the control board and enclosure for those solar home systems being installed by the Vendor has been supplied and independently inspected and tested by an independent electrician selected by DoE; and
k If the Product is approved the final approval process is the provision of the Beneficiaries Product manual that will be provided with each system

9. Product Registration Process

9.1 Application by Vendor

Final opportunity for vendors to submit new products for approval is the 31st of October 2021. The solar home systems will only be approved as a Product eligible for inclusion in the Product Catalogue for that specific Vendor if their Vendor application is successful.

The Product approval process requires submission to the Department of Energy of a completed product application form (provided in Sections 22 and 23)

The completed application must include all the information requested in the form. Where the form is incomplete, the document will be returned to the vendor informing them which information is outstanding.

The form is provided as a Word document and the Vendor must submit an application in the same order as shown on the document and must respond to all questions in sections 22 and 23 that are relevant to the approval of their product.

It is recommended that the Vendor use the Word document as the pro-forma for their application.

The Product Application Form shall be submitted electronically or as a hard copy.

The electronic version can either be provided on a CD or memory stick or e-mailed to:

Director
Department of Energy
Email: gantony@vanuatu.gov.vu

Or

Program Manager
Vanuatu Rural Electrification Project
Department of Energy
PMB 9067
Email: vrep@vanuatu.gov.vu

The hard copy along with CD or memory stick shall be submitted to:

Director
Department of Energy
PMB 9067
Port Vila

Or

Program Manager
Vanuatu Rural Electrification Project
Department of Energy
PMB 9067
Email: vrep@vanuatu.gov.vu

Note: The Product approval application form requires the submission of manufacturers catalogues. Where manufacturers catalogues are not available electronically, a hard copy must be submitted. However, if the Product is ultimately selected to be part of the program, suitable photos of the Product will be required to be included in the Product Catalogue to be developed and distributed.

9.2 VREP II Component I Product and Micro-Grid System Processing Application by Department of Energy

Upon receiving an application for Product or Micro-Grid System to be approved, the DoE will complete the checklist as provided as Section 25. This checklist details how to undertake the verification process, as summarised below and shown in the flowchart in Figure 3.

The person undertaking the verification process at the DoE or on behalf of the DoE shall, as a minimum, meet the same requirements as specified in section 4.7 for being a:

- System designer;
- Solar Installer; and
- Electrical Technician.

Note: For the purpose of product approval an electrical engineer can meet the electrical technician requirements.

In summary the verification process involves:

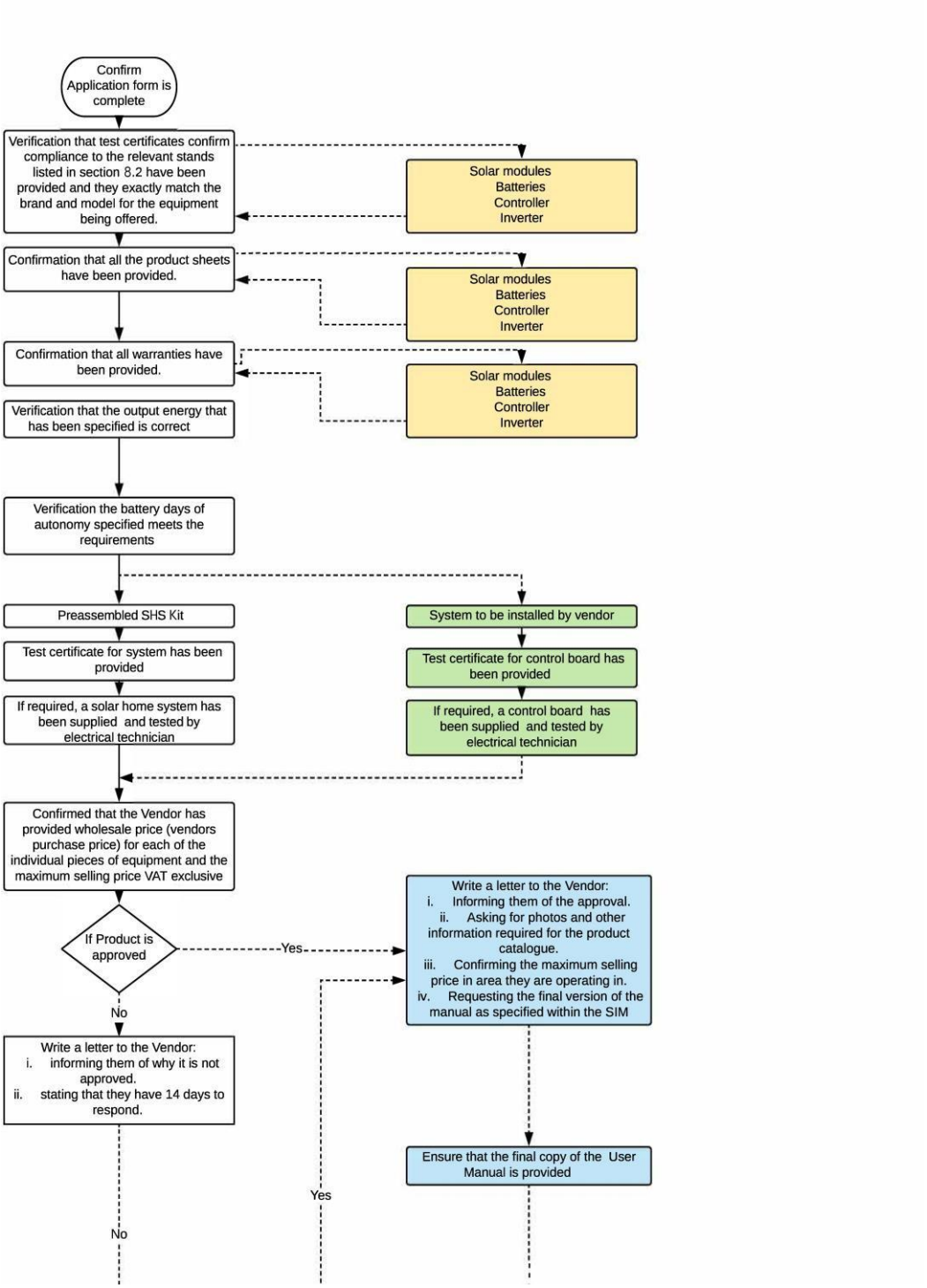
1. Confirmation that the application form is complete.
2. Verification that for all the individual pieces of equipment (e.g. solar module, battery, solar controller and inverter) the test certificates confirming compliance to the relevant stands listed in section 8.2 have been provided and they exactly match the brand and model for the equipment being offered.
3. Confirmation that all the product sheets have been provided.
4. Confirmation that the product warranties have been provided and verified that they all have a minimum of 2 years' warranty, with the solar modules having 10 years.
5. Verification that the output energy that has been specified is correct by using the solar home system performance program.
6. Verification the battery days of autonomy specified meets the requirements as specified in section 8.1.
7. Confirmation that the test certificate (refer section 8.5) for the solar home systems being provided as preassembled SHS kit have been provided.
8. If required, a solar home system has been supplied and the system has been tested and certified by a licensed electrician that it meets standards and is electrically safe.
9. Confirmation that the test certificate (refer section 8.5) for the solar home system control board or enclosure being installed by the Vendor have been provided.
10. If required, a solar home system control board or enclosure has been supplied and has been tested and certified by a licensed electrician that it meets standards and is electrically safe.

11. Confirmation that the Vendor has provided approximate maximum installation price for each of the systems for each of the Islands in which they will operate
12. Enter the product information in the product approval checklist.
13. If the product is approved:
    a. Write a letter to the Vendor:
        i. informing them of the approval.
        ii. asking for photos and other information required for the product catalogue.
        iii. Confirming the maximum selling price in area they are operating in.
        iv. Requesting the final version of the manual as specified within the SIM
    b. For preassembled Solar Home System kits the final version of the User Manual has been provided for the products and verification that it includes the following items:
        i. How to correctly install the solar module so that it receives sun each day and is not shaded.
        ii. How to correctly install the control board or enclosure.
        iii. How to correctly install the battery.
        iv. How to interconnect the solar module, the control board or enclosure and the battery.
        v. A description of the operation of the system and how to correctly use the system, particularly with respect to the hours of usage of each of the lights and other appliances (this should be provided in local language)
        vi. Information on the safe use of electricity and electrical hazards (this should be provided in local language).
        vii. List of equipment supplied.
        viii. Shutdown and isolation procedure for emergency and maintenance.
        ix. Maintenance procedure and timetable.
        x. Installation checklist.
        xi. Warranty information for the whole system and each item of equipment.
        xii. System connection diagram.
        xiii. Equipment manufacturers documentation and handbooks for all equipment supplied.
        xiv. The Vendor's returns policy.
        xv. How to dispose of the used battery when requiring a replacement. and/or the process of how to return the used battery to the Vendor for recycling.
        xvi. Grievance redress process.
    c. For Solar Home Systems and Micro Grid Systems that will be installed by the Vendor the Final version of the User Manual has been provided for the products and verification that it includes the following items
        i. A description of the operation of the system and how to correctly use the system, particularly with respect to the

hours of usage of each of the lights and other appliances (this should be provided in local language).
ii. Information on the safe use of electricity and electrical hazards (this should be provided in local language).
iii. List of equipment supplied.
iv. Shutdown and isolation procedure for emergency and maintenance.
v. Maintenance procedure and timetable.
vi. Commissioning records and installation checklist (sample).
vii. Warranty information for the whole system and each item of equipment.
viii. System connection diagram.
ix. Equipment manufacturers documentation and handbooks for all equipment supplied.
x. The Vendor's returns policy.
xi. How to dispose of the used battery when requiring a replacement. and/or the process of how to return the used battery to the Vendor for recycling.
xii. Grievance redress process.

d. When all details obtained add the product details to the product catalogue.

14. If the product is not approved:
    a. Write a letter to the Vendor:
        i. informing them of why it is not approved.
        ii. stating that they have 14 days to respond.
        iii. based on the response either approve the product or the product remains unapproved.
    b. If product is approved follow the requirements as per point 11
15. File the checklist, product approval application and all relevant documents in the vendors file and project file.


Confirm Application form is complete
Verification that test certificates confirm compliance to the relevant stands listed in section 8.2 have been provided and they exactly match the brand and model for the equipment being offered.
Solar modules
Batteries
Controller
Inverter
Confirmation that all the product sheets have been provided.
Solar modules
Batteries
Controller
Inverter
Confirmation that all warranties have been provided.
Solar modules
Batteries
Controller
Inverter
Verification that the output energy that has been specified is correct
Verification the battery days of autonomy specified meets the requirements
Preassembled SHS Kit
Test certificate for system has been provided
If required, a solar home system has been supplied and tested by electrical technician
System to be installed by vendor
Test certificate for control board has been provided
If required, a control board has been supplied and tested by electrical technician
Confirmed that the Vendor has provided wholesale price (vendors purchase price) for each of the individual pieces of equipment and the maximum selling price VAT exclusive
If Product is approved
Yes
No
Write a letter to the Vendor:
i. Informing them of the approval.
ii. Asking for photos and other information required for the product catalogue.
iii. Confirming the maximum selling price in area they are operating in.
iv. Requesting the final version of the manual as specified within the SIM
Write a letter to the Vendor:
i. informing them of why it is not approved.
ii. stating that they have 14 days to respond.
Ensure that the final copy of the User Manual is provided
Yes
No

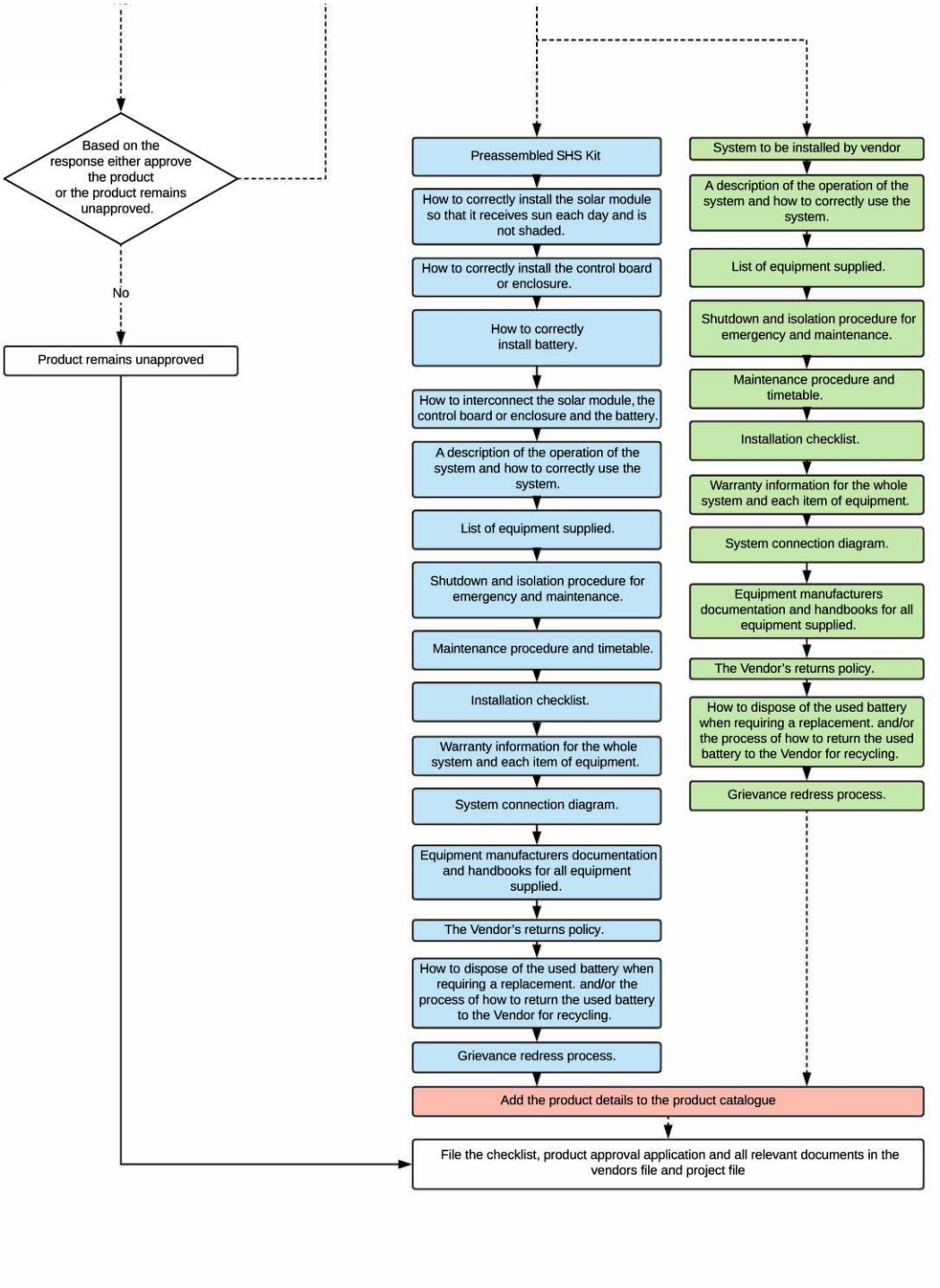


Figure 3: Processing Product Applications for VREP II Component I

10. Product Catalogue

After the initial approval of Products and Micro-Grid Systems the DoE developed a Product Catalogue containing all the Products.

The Product Catalogue includes:

a) generic information on of the energy load that can be connected. There will also be a price range to cater for products purchased in cash and on payment plan.

b) General Information on the program for the Beneficiaries including:

- Who is eligible to purchase a subsidised Product or Micro-Grid System?
- What to do to purchase a Product?
- What happens when Product is purchased?
- What happens if there is a problem with a Product?

c) List of all the Products eligible to receive a Subsidy including:

- The peak watt rating of the solar array
- The DC system voltage- Battery and Solar
- The capacity of the battery bank in Ah
- Whether the output of the system is DC only, AC only or AC and DC.
- What is the size of the inverters in Watts?
- How many watthrs per day the system can provide based on type of controller and the system assumptions and efficiencies as provided in section 8.1.
- The days of autonomy for the battery.

d) List of all the Vendors, their contact details and all their outlets and distribution points.

.

The Product catalogue will be widely distributed by DoE and where necessary it will be translated into local languages. The Product Catalogue with be in:

- Hard Copy at Government Outlets
- Hard Copies at Post Offices
- Electronically on the website and via Facebook

Media promotions (Radio, Paper) will state where the Product catalogue is available.

There should be an issue date on the Product Catalogue and when a new catalogue is released it should state that it supersedes any previous catalogue.

If a Product has been de-registered than the DoE will make a decision on whether a new Product Catalogue will be published or whether just a smaller document stating which Products are now in-eligible for a Subsidy will be published

Note:
1. The Department of Energy has the final discretion on whether to register a Product
2. The Project Catalogue will be subject to a "no objection" from the World Bank

11. Why and how Products will be de-registered.

Products will be deregistered and removed from the Product Catalogue if:

1. For Products and Micro-Grid Systems offered under VREP II Component I, any of the individual pieces of equipment have been changed and the new models are not tested and certified in accordance with the relevant equipment standard.
2. If the Product has an unacceptable number of failures in the field and the Vendor is unable to provide an acceptable explanation for failures. An unacceptable number would be in the order of 5 to 10+%. However, this figure could be reviewed during the program. When the DoE has become aware of this level of failure, the Grievance process as described in Section 18 would be implemented.
3. If the Vendor supplying a specified product has been de-registered and no other Vendor is willing or able to supply that Product.

When the DoE intends to remove a product from the Product Catalogue for any of the above reasons, The Vendor/s offering that product for sale at that time will receive notification of this intention. The DoE will decide whether a new catalogue should be published or just a document notifying which Product(s) have been removed.

12. Responsibility of Vendor when selling a solar home system or micro grid system being offered under VREP II Category I

When selling a solar home system or micro-grid system the Vendor shall:

a In consultation with the Beneficiary:
   i complete a load assessment sheet provided in section 32.
   ii determine where on the beneficiary house, business or public institution the solar array will be located;
   iii ask whether it will be shaded at any time during the day and if so what time of day the shading commences and for how long;
   iv determine what direction and it will be facing and what is the tilt angle (approximately) of the roof;

b Determine the effect of any shading on the systems' energy output. If the solar array will be shaded determine how much the irradiation value of 4kWh/m^2 is derated and determine the new effective output of the various systems offered in the Product catalogue:

c Determine the effect of not facing the solar array true north on the systems' energy output. If the solar array is not facing true north use the table provided in section 34 and how much the irradiation value of 4kWh/m^2 or the derated value determined in b above is derated based on the orientation and tilt. Then determine the new effective output of the various systems offered in the Product catalogue.

d Determine the best system for the Beneficiary. Based on the load assessment completed in (a(i)) and the energy outputs (derated if required in (b) and (c) of the systems you have offered in the Product Catalogue determine which system best suits the needs of the Beneficiary.

If the Beneficiary purchases the selected system, the Vendor shall complete and sign the System Design Declaration Form Provided in section 28.

The Load Assessment Forms and the System Design Declaration Form must be included in the Manual provided to the Beneficiary and must be provided with your Subsidy re-imbursement applications.

13. Installation of Solar Home Systems or Micro Grids for VREP II Component I

13.1 Installer Requirements

Where the Vendor is required to install the solar home system or micro grid the installation of the:

a) Solar array, battery, solar controller, inverter and DC wiring of the system shall be undertaken by a solar technician with the qualifications as defined in section 4.7.

b) AC wiring system shall be undertaken by an electrical technician with the qualifications as defined in section 4.7.

13.2 System Installation excluding AC or DC house wiring

The system shall be installed in accordance to the PPA/SEIAPI Off-Grid PV Power Systems- System Install Guidelines with the following amendments or additions:

a) Cable losses between the PV array and the controller should never exceed 3% (tables are provided in section 33 of the SIM)
b) Cable losses between the battery bank and the inverter should never exceed 5%
c) The battery bank shall be installed within a suitable enclosure or box.
d) For lead acid type batteries, the box/ enclosures shall have inlet and outlets vents in accordance with the formulas in the PAP/SEIAPI Off-Grid PV Power Systems- System Install Guidelines for the Installation. Figures 4 and 5 show possible layouts,
e) For lithium ion type batteries, the box/enclosure shall be provided with sufficient ventilation to meet the manufactures'' cooling requitements for the battery.
f) There shall be fuses protecting both the positive and negative battery cables. These should be located as close as possible to the battery enclosure but either 100 mm below the top of the enclosure or 500 mm away in the horizontal direction. They can be mounted on the enclosure but not on the same side that the ventilation inlet or outlet is located.
g) For lithium ion type batteries, the BMS protection devices may meet the requirements for over-current protection of the output cables from the battery system where—
    iii. the BMS includes over-current protection which is a readily available circuit-breaker or HRC fuse; and
    iv. the battery manufacturer's instructions permits the over-current protection of the BMS to meet the over-current protection of the battery outgoing cables.
h) For systems using lead acid type batteries, there shall be nothing installed above the battery enclosure/box. The battery enclosure/box is required to be positioned so that any gases caused by overcharging should be vented to outside the house.
i) The battery fuses may be rated to protect all the cables in the system, that is solar module cables, inverter cable and the DC load cables (if applicable). The fuses shall be rated to protect the cable in the system with the smallest diameter and hence lowest current carrying capability. However, the fuses must be rated to carry the maximum current required to meet the loads and the maximum charge current to the batteries. If the fuses cannot protect all the cables in the system then additional suitably rated protection devices (fuses or DC rated circuit breakers) shall be located for each cable at the end closest to the battery. If the controller includes protection devices on the load side then this will meet the requirement for protecting the cables supplying the DC loads only if the current carrying capacity of the load cables is greater than the controller's protection device current rating.

j) It is recommended that a DC isolation switch be mounted in both the negative and positive solar cables beside the solar controller to facilitate isolation of the solar array for testing and maintenance purposes.
k) All cabling shall be mechanically supported, that is using appropriate clips.
l) If the array cable is mounted across the roof and goes over the edge of a corrugated roof, then the portion near the sharp edge of the roof shall be mounted inside suitable conduit to prevent the cable from beingdamaged.
m) No cables shall hang loose that could be pulled by anyone.
n) For micro-grid systems where the PV array has an open circuit voltage at the lowest ambient temperature greater than 120V DC (that is defined as low Voltage) the solar array frame shall be electrically bonded in accordance to the requirements of AS/NZS5033- Installation and safety requirements for photovoltaic (PV) arrays

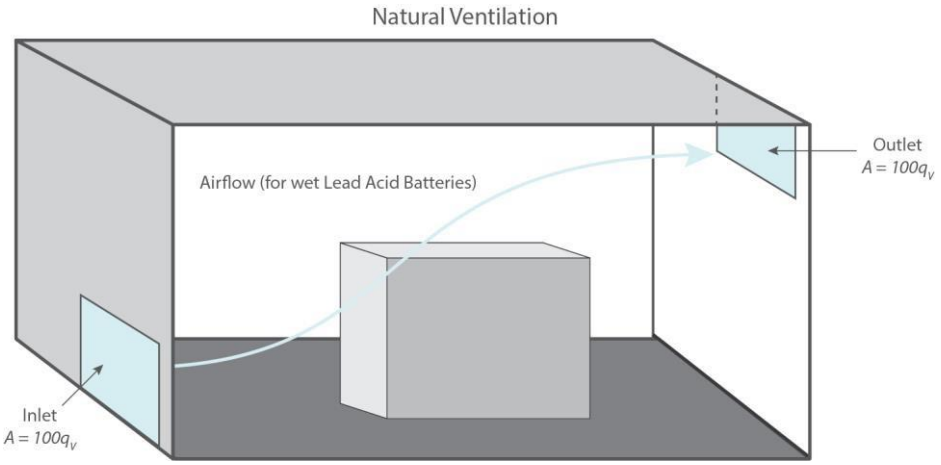


Figure 4: *Battery Box showing vents on opposite side sides*

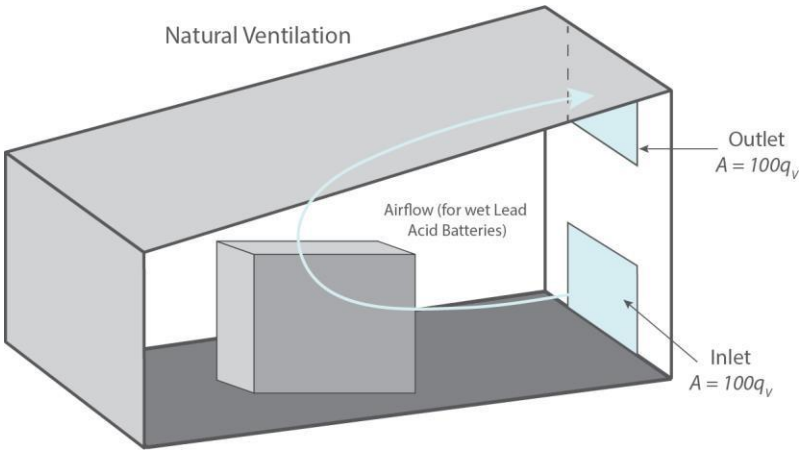


Figure 5: Showing vents on one side

At the completion of the installation the Installation Inspection and Test Sheets (refer section 37) shall be completed and a copy submitted with subsidy reimbursement application.

Photos of the completed system shall be taken and also submitted with subsidy reimbursement application. As a minimum the photos shall include the following showing:

- solar array mounted on the roof/pole;
- the array cabling on the roof and down the wall to the control board/enclosure.
- The control board or enclosure.
- The battery box including the warning sign
- The fuses for the battery bank
- The cabling between the battery bank and control board/enclosure

13.3 Interconnection of the system to DC Loads

If the house, business or public institution has existing DC lighting and power circuits which will be interconnected to the new solar home system then the existing wiring must be inspected to ensure that it is safe to connect. The DC System Test certificate (refer section 38) shall be completed and the inspection shall include:

a) a visual inspection to see if there are any damaged cables or poor connections where there is a possibility of a short occurring between the positive and negative cables or terminals;
b) reviewing the existing cables cross section area to ensure that the cable has the current carrying capacity for the largest current that the cables will carry; and
c) determining the size of the existing cables and their lengths and calculating, what is the voltage drop between the battery and the furthest load and also the largest load. (Note the maximum voltage drop between the batteries and the furthest or largest load shall be no greater than 5%)

If any of the cables are located where they cannot be seen in a visual inspection, consideration should be given to performing an insulation (megga) test to check the insulation between the positive and negative cables.

If there is no existing cabling and the Vendor will be installing DC house wiring when installing the solar home system, then the Vendor's technician must follow the relevant section of AS/NZS3000 that relate to the installation of extra low voltage wiring. The cables shall:

a) have a current carrying capacity to meet the maximum load current for the circuit;
b) be sized to have a voltage drop between the battery and the furthest load and also the largest load of no greater than 5%;
c) installed with sufficient mechanical support so there are no loose cables that could be pulled easily by people.

Any light switch shall be rated for DC and the maximum DC current that it will carry.

Any power outlet should have pin configuration not the same as those used for AC power outlets. In some countries it is typically a 2 PIN in a T arrangement as per Figure 6.

Figure 6: Example of DC Power Outlet

Whether the cabling is already installed or installed by the Vendor's technician, the DC cabling shall be electrically protected by either:

a) the fuses at the battery; or
b) the DC controller if it has that built in protection; or
c) the installation of new suitably DC rated fuses.

13.4 Interconnection of the system to AC loads

If the house, business or public Institution has existing AC lighting and power circuits which will be interconnected to the new solar home system then the existing wiring must be inspected and tested to ensure that it is safe to connect and the AC System Test certificate (refer section 39) shall be completed. This inspection and test shall include as a minimum:

a) inspection of existing wiring for any exposed live terminals;
b) inspection of cables to see if there are any damaged cables or poor connections where there is a possibility of a short occurring or possible live cables being exposed;
c) undertaking a polarity test on existing power outlets, light switches and lights to ensure no cables are transposed;
d) insulation testing of the wiring; and
e) confirming that the wiring is protected by circuit breakers which are rated correctly.

A Residual Current Device (RCD) is to be installed on the switchboard to act as the main switch for the house, business or public institution.

14. Charging VAT in the Subsidy Program

The VAT will only be charged on the actual price paid by the Beneficiary.

As an example:
For existing VREP I subsidy of 50%:

Total Selling Price of Product: 10,000VATU (VAT Exclusive)

Less 50% of VREP Subsidy: 5,000VATU
Beneficiary Contribution: 5,000VATU
VAT @ 12.5% = 625VATU

Total Beneficiary contribution: 5,625VATU

For existing VREP II Component I subsidy of 33 1/3 %:

Total Selling Price of Product: 100,000VATU (VAT Exclusive)
Less 33 1/3% of VREP Subsidy: 33,333VATU
Beneficiary Contribution: 66,667VATU
VAT @ 15% = 10,000VATU

Total Beneficiary contribution: 76,667 VATU

15. Subsidy Re-imbursement Process

15.1 Subsidy Rates

For VREP II Component I, the initial Subsidy has been established at 33 1/3% of the retail price of the installed solar home system and micro grid system..

The Subsidy payment is subject to availability of grant funds under the project. Every three months the DoE/VA shall provide a report to all Vendors informing them of the balance of monies available for subsidies.

A claim for Subsidy from a Vendor will be paid following verification of claims and in accordance with the VA's findings in the Output Verification Report (OVR). Subsidy payments will be made via the Designated Account to the Vendor. Physical verification can occur before or after payment at DoE's discretion, however, phone verification must occur before payment for Subsidy is made.

15.2 Vendor Process

The Vendor will make a claim for Subsidy re-imbursement for a Product sold only once for cash sales and for those products sold on Payment Plans as soon as the customer signed-up for the product. Payment will be made based on whichever of the following circumstances occur first:

Either

1. Subsidy re-imbursement due is 3,000,000 VATU (not including VAT);

Or

2. Any subsidy owed by the project to the vendoron 31st December 2021.

15.2.1 VREP II Component I Subsidy re-imbursement Claim

The Vendor shall provide the following information with their claim:

1. A completed subsidy re-imbursement application form (Attachment 29.2).
2. The Excel Product sales database, which is provided to the Vendor at the time of their approval as Vendor, with the file name containing: the name of the Vendor; the word *subsidy*, the word VREP II and the date when the subsidy re-imbursement is submitted, e.g. *VendorNameSubsidyVREPII 060917*.

The excel data base will include the following information for each Product sold for which the Vendor is claiming a subsidy re-imbursement:

- Date of Sale or signed-up for products purchased through Payment Plan;
- Beneficiary Name;
- Village Name and Island name;
- Contact details for Beneficiary;
- Whether product was for house, aid post or community hall;
- The name of the head of the household
- Whether the head of household is male or female;
- Serial number of the individual Product components;
- System type: Size 1, Size 2, Size 3, Size 4;
- Size of array in in Watts (W);
- Size of battery in Amphours (Ah);
- Size of Inverter in Watts (W)
- Sale Price including installation (VAT exclusive);
- Where the sale was made;
- Date of installation;
- If Receipt of sale for cash sales and for products purchased through Payment Plan, signed-up documents on the products including all required information was provided;
- If Declaration Form or a document confirming that they signed-up to the Payment Plan and product provided including all required information was provided.
- Photos of installation as specified in section 13.2

3. A copy of the receipt, and signed-up Payment Plan Agreement signed by the Beneficiary or has their signature that includes the full selling price of the Product sold and the actual price paid or deposited by the Beneficiary.

4. A copy of the declaration form (Section 27) or signed-up Agreement for Payment Plan signed by the customer stating:
   - That the system is to be used to provide lighting and other electrical services at the household/business/public institution (include what is relevant) located outside the Concession Areas or within the Concession Areas that are not likely to have grid connection within the next four (4) years.
   - That the Vendor has explained the company's returns policy and the products warranty terms and has provided information on how to dispose of the used battery when purchasing a new one.

5. A copy of the completed load assessment form (Section 32)

6. A copy of the System Design Declaration Form (Section 28).

7. A copy of the installation inspection and test sheet for those systems that were installed by Vendor. (Section 37)

8. A copy of the DC wiring Test Certificate (if applicable) and name (if pre-qualified) or qualifications of the Solar Technician for those systems that were installed by Vendor. (Section 38)

9. A copy of the AC wiring Test Certificate (if applicable) and name (if pre-qualified) or qualifications of the Electrical Techincian for those systems that were installed by Vendor. (Section 39)

10. Photos of each system as specified in section 13.2

11. The grievance database, which is provided to the Vendor at the time of their approval as Vendor, should indicate the file name containing the name of the Vendor, the word grievance, the word VREP II and the date on which the subsidy re-imbursement is submitted, e.g. *VendorNamerGrievance VREPII060917*.

    The Excel database will include the following information for each successive complaint. For each complaint, the database shall include:
    - Name of customer;
    - Date grievance was first made to the Vendor;
    - Type of product;
    - The Nature of the grievance;
    - Record all actions taken to solve the grievance and date; and
    - State if grievance is still outstanding and if concluded what was the outcome.

If there are some receipts and signed declarations or signed-up Payment Plan Agreement that have not been returned from the outer islands at the time of submission, the Vendor may submit the subsidy re-imbursement application. However, the outstanding receipts and signed declaration forms or signed-up Payment Plan Agreement must be presented prior to or with the next claim. If, at the time of the next subsidy claim reimbursement, there remains receipts and/or declaration forms or signed-up Payment Plan Agreement outstanding from the previous subsidy reimbursement application, then the value of the subsidy reimbursement made previously for the not submitted receipts/declaration forms or signed-up Payment Plan Agreement will be deducted from the total value of the new subsidy claim. The subsidy reimbursement owed for the not submitted documents will not be paid until the original documents are submitted.

The Subsidy re-imbursement application shall be submitted either be provided on a CD or memory stick or e-mailed to:

Director
Department of Energy
Email: gantony@vanuatu.gov.vu

And copy

Program Manager
Department of Energy
Email: vrep@vanuatu.gov.vu

15.3 Department of Energy Process

Upon receipt of a Subsidy re-imbursement claim the DoE will complete the first part of the checklist as provided in Section 30. This checklist details how to undertake the process, as summarised below and shown in the flowchart in Figure
7. The DoE:

1. Ensures copies of the excel sales and grievance databases are kept electronically. The DoE shall maintain a central database on all greviance received by vendor and category as set out under the grievance processes.
2. Provides the following documents to the Verification Agent:
    a. The completed subsidy re-imbursement application form.
    b. The Excel product sales database.
    c. The receipts and Beneficiary signed declaration forms or signed-up Payment Plan Agreement that were supplied together with the application.
    d. For VREP II Component I claims:
        i. The load assessment form.
        ii. The System Design Declaration form.
        iii. The System Installation and Test sheets
        iv. The DC wiring Test certificates
        v. The AC wiring test certificates
        vi. Photos of the installation
    e. The Excel Grievance database

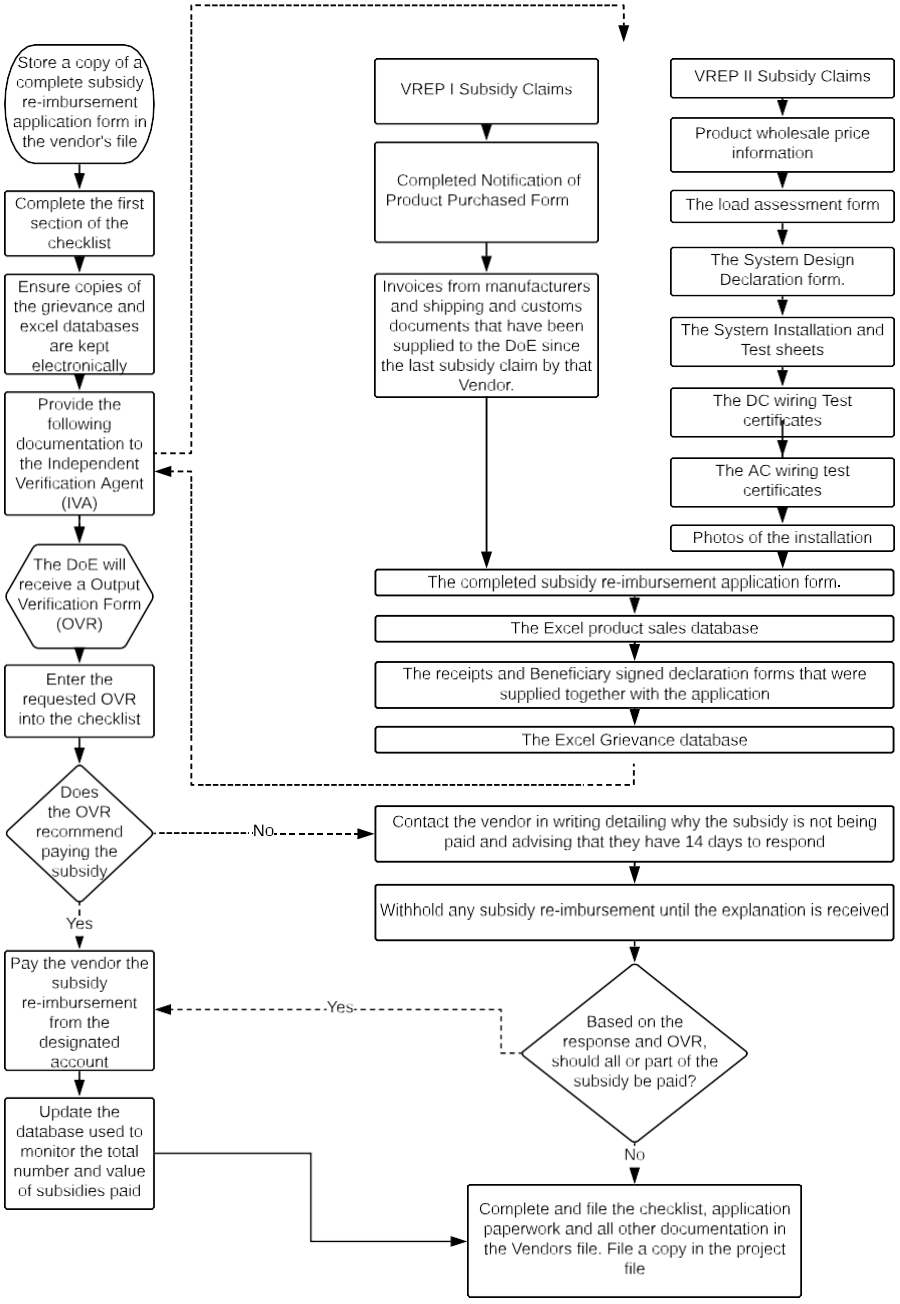


Figure 7: DoE's Activities in Processing the Subsidy Re-imbursement Claim

15.4 Verification Agent Process

The Verification Agent assesses the Subsidy re-imbursement application against the following verification criteria and completes the subsidy re-imbursement checklist (Section 31):

15.4.1 Processing Subsidy Re-Imbursement Application for VREP II Component I

1. To verify a correctly completed subsidy re-imbursement application form and required photos (as per section 13.2) has been submitted.
2. To verify that the Excel Product (including Micro Grid systems) sales database has been provided and is complete.
3. Verify that all Products (including Micro Grid systems) sold are in the product catalogue at the time of sale.
4. Verify that for all Products (including Micro Grid systems) that the energy produced by the system is greater than the total daily energy determined on the load assessment form.
5. Verify that the battery in each system can supply the maximum load current indicated in the system design declaration form.
6. To verify that the total number of sales on the application form matches the number of sales listed in the sales database.
7. To verify that the value of subsidy being claimed on the application form matches the total value on the sales database.
8. To verify that the number of receipts provided matches those indicated in the sales database.
9. To verify that the number of signed declaration forms provided matches those indicated in the sales database.
10. To verify that all serial numbers are unique and have not been used previously.
11. Verify that the System Design Declaration form has been completed and the system provided meets the energy needs of the beneficiary as determined by the load assessment sheets.
12. Verify that the system has been installed in accordance with the requirements of the SIM and Inspection and Test Sheets have been completed correctly.
13. Verify the installation has been undertaken by qualified solar and electrical technicians
14. Verify (if applicable) that the DC wiring has been inspected and tested by a Solar Technician and the test certificate completed correctly.
15. Verify (if applicable) that the AC wiring has been inspected and tested by an Electrical Technician and the test certificate completed correctly.
16. Review the last sales database supplied by the Vendor with the previous subsidy re-imbursement claims and ensure that if there have been any outstanding receipts and/or declaration forms that these have been received.

17. If any of the information provided by the Vendor appears to be incorrect or confusing in any way, the VA shall contact the Vendor for clarification. The outcome resulting from this should be included in the OVR.

18. For vendor installed systems, add the GPS coordinates of all received installations into a map, as well as a database to ensure that physical visits can be coordinated for maximum site-visit yield, and that customer name and phone number details are recorded.

19.

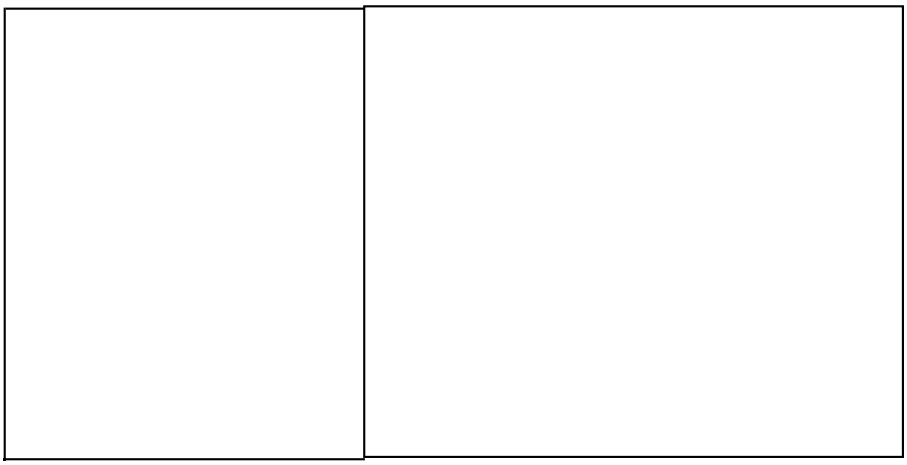
For Solar Home Systems:

20. Select a minimum of 50% of sales (random sample) that will be verified by either:
    a. phoning the beneficiaries during the initial verification process, which must be completed within 4 weeks of a claim for subsidy being received; or
    b. For vendor installed systems, reviewing the geo-tagged photos (showing GPS coordinates of the site) of the installation to confirm compliance to SEIAPI installation guidelines. Photos should contain beneficiary in them. ID copy of beneficiary must also be obtained. Vendors can also submit videos with the beneficiary to confirm installation.

21. Payments for verified products will be paid in accordance with the payment schedules following.

Verification	Subsidy payment

Random sample of 50% of recipients will be selected. They will be verified by either telephone, or review of geo-tagged photos (in the case of vendor-installed systems) for vendor installed systems. Photos should contain beneficiary in them. ID copy of beneficiary must also be obtained. Vendors can also submit videos with the beneficiary to confirm installation.	Determine the percentage of the beneficiaries from the sample who were verified by either method (phone or through review of photos). Define the successfully verified participants as x% Subsidy payment is then based on the eligible subsidy amount claimed (A) multiplied by X%. **Example:** Vendor (V) claims to have sold 1,000,000 Vatu worth of eligible products then the subsidy due is 333,333 Vatu (A). If the verification of the sample finds that only 80% (X) of the sales are eligible then the vendor is paid 333,333 x 0.8 = 266,666 Vatu.



For Micro-Grid Systems:

22. All be verified by either:
    a. phoning the beneficiaries during the initial verification process, which must be completed within 3 weeks.
    b. through reviewing the geo-tagged photos of the installation to confirm compliance to SEIAPI installation guidelines. Copy of ID must be submitted for verification from photos. Vendors can also submit videos with the beneficiary as well.
23. Photos for installations, and installation commissioning documentation will be cross checked by the VA to determine that installations took place in accordance to SEIAPI installation guidelines.

Any Micro-Grid System that cannot be verified will not receive a subsidy and the Vendor and a formal grievance process as detailed in section 18 will commence.

15.4.2 Physical Verifications

The VA, in partnership with a contracted electrician will undertake 3 physical verification field missions covering Malampa, Sanma and Tafea prior to 28th February 2022. The aim of the visits is to check vendor compliance to SEIAPI installation standards and AS/NZ3000 wiring standards. During the site visits, the IVA will:

a. complete the Installation Inspection and Test Sheets as contained in section 37 to verify that the system meets the required installation standards specified in the SIM.
b. Where a SHS and microgrid are equidistant, the inspection of a microgrid system shall take precedence
c. Where IVA finds fault in a system wiring/installation during physical visits, the vendor's subsidy for that system will be deducted from future subsidy payments until issues are rectified
d. If IVA notes continuous failure points within vendor installations, the DOE will require the vendor to cover the cost of independent inspections on a case by case basis for future installations until the DOE is satisfied that the vendor has taken steps to remedy installation faults.

15.4.3 Processing Grievance Data Base

1. To verify that the grievance database has been provided.
2. To review grievances and record information as requested in checklist.
3. If there is a high representation of grievances, to review these and, if deemed necessary, follow up with the Vendor. Include this and all outcomes in the OVR.
4. To Update the project grievance database with the information provided by the vendor as follows:
    a. Copying and pasting the vendor's database provided into the worksheet dedicated to that Vendor in the excel project grievance database.
    b. Copying and pasting the vendor's database provided into the first worksheet of the excel project grievance database which includes all the grievances under the project.

15.4.4 Verification Report

1. Complete the verification report.
2. If the verification report recommends reimbursing the subsidy, update the Excel project sales database using the database that was provided by the Vendor by

   a. Copying and pasting the vendor's database provided into the worksheet dedicated to that Vendor in the excel project sales database.
   b. Copying and pasting the vendor's database provided into the first worksheet of the excel project sales database which includes all the sales under the project.
3. Submit the Output Verification Report (OVR) and the two updated project databases to the DoE.

After receiving the OVR, the DoE will:

1. Enter the requested OVR information into the checklist.
2. If the report recommends paying the subsidy:
   a. Pay the Vendor the subsidy re-imbursement from the Designated Account. The Vendor should be paid within 30 days of the submission of the subsidy re-imbursement claim.
   b. Update the database used to monitor the total number and value of subsidies paid.
3. If the report recommends not to pay the subsidy or part of the subsidy:
   a. Contact the Vendor in writing detailing why the subsidy is not being paid and advising that they have 14 days to respond in writing.
   b. Withhold any subsidy re-imbursement until the explanation is received.
   c. Based on the response and the output verification, report determine if all or any of the subsidy re-imbursement claims should be paid from the designated account.
   d. If part or all subsidy to be paid, pay the Vendor the subsidy re-imbursement from the Designated Account.
   e. Update the database used to monitor the total number and value of subsidies paid.
   f. File checklist, application paperwork and all other documentation in the Vendors file and a copy in the project file.

The above three processes are summarised in the flowchart shown in Figures 8,9 ,10 and 11.

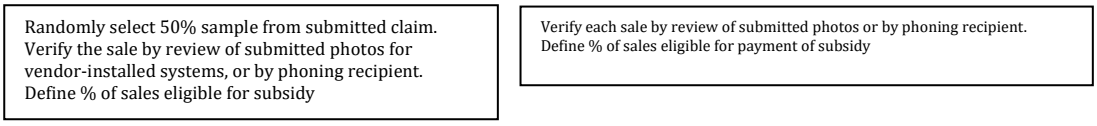


Figure 9: VA's Activities in Processing the Subsidy Re-imbursement Claim VREP II
Note verification may also be done by review of geo-tagged photos and videos as described in section 15.4.1 above

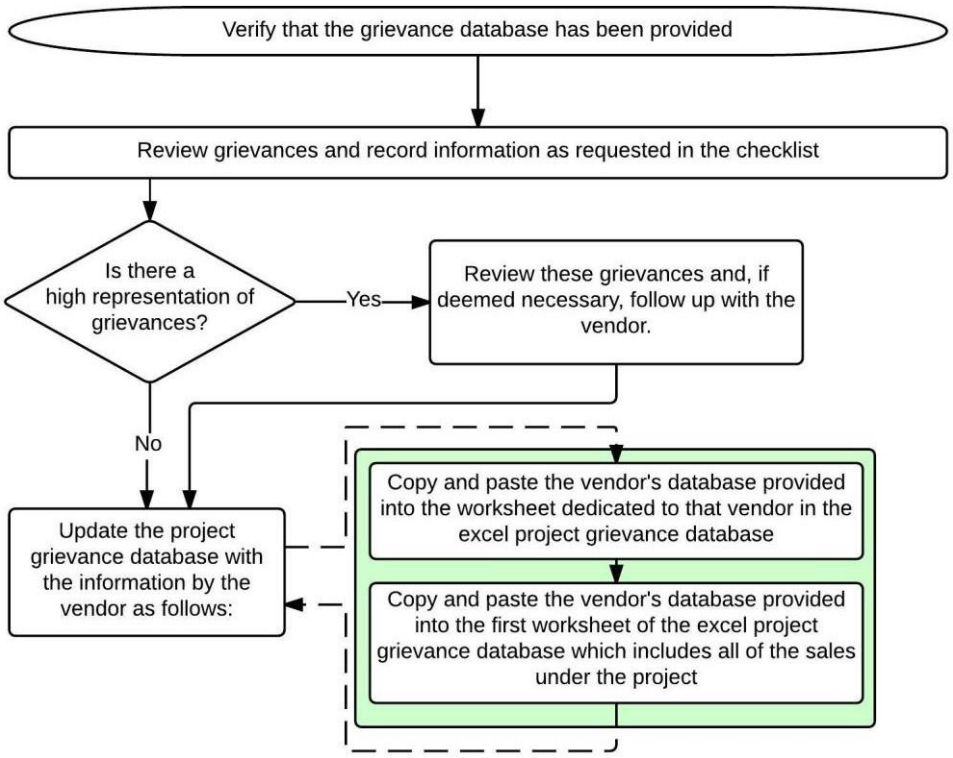


Figure 10: VA's Activities in Processing the Grievance Data Base

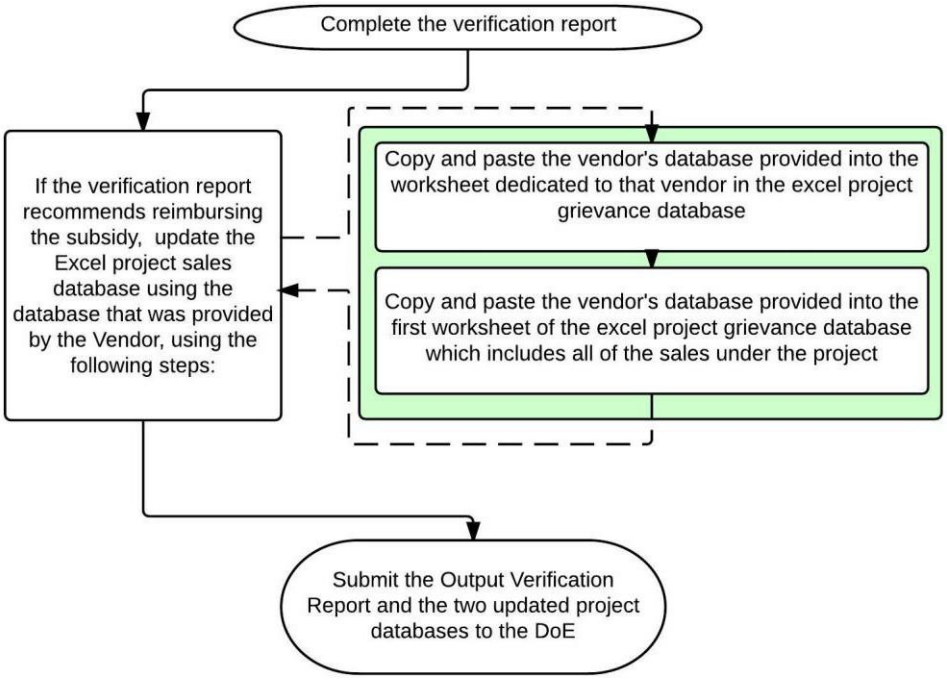


Figure 11: VA's Activities in Processing the Finalising The verification Reports

16. Code of Conduct for Vendors

All Vendors:

a) Shall act so as to uphold and enhance the honour, integrity and dignity of the VREP by associating, in their business activities, exclusively with individuals and enterprises of good character.

b) Shall solicit sales, advertise and promote their products with dignity and truth, avoiding any potentially misleading statements or omissions.

c) Shall apply their skill and knowledge in the interest of their customers for whom they act as faithful agents.

d) Shall deal honestly and truthfully with customers and the Department of Energy in all matters pertaining to payments and the subsidy and the conditions applying to them.

e) Shall observe and conform to all applicable laws, ordinances, regulations and any business related codes of practice.

17. Vendor's Beneficiary Grievance Process

Complaints made by Beneficiaries to Vendors will vary and will generally fall into 2 categories:

a) Technical
b) Customer Service

Section 17.1 provides an overview of the technical nature of complaints that might be made to the Vendor. Section 17.2 describes as a minimum the process that a Vendor must follow once a complaint has been received. This section has been developed to assist Vendors to prepare a suitable Grievance Process, which can then be included in their business plan.

17.1 Technical Related Complaints

Customer complaints to Vendors will vary immensely. Some examples of technical complaints related to the supply of solar home systems include:

a) The lights (and other appliances) are not operating for the length of time provided in the promotional material for the product.
b) One or more individual components, in particular the lights, are not operating.
c) The whole system is not working.

The technical problems related to these systems are usually classified as either Beneficiary caused failure or component(s) failure within the system. The Vendor is required to have an internal process relating to their particular product or products to state how to determine whether the failure is caused by the Beneficiary or by a product component having failed.

It is anticipated that this process will involve a series of questions relating to the problem stated which the Vendor or their representative on the outer islands will ask the customer. The following points have been written to assist the Vendor to develop their questions as part of this process.

Possible system related issues include:

a) Beneficiary incorrectly installing the Product;
b) Beneficiary incorrectly using the system, i.e. typically overuse. The Product should include safety measures as part of the controller's operation to prevent this from happening.
c) Beneficiary damaging the Products and/or components by dropping them or by incorrect handling. (Note: this should be obvious)

17.2 Grievances Procedure: Minimum Requirement

As stated in Section 4.9, the Vendor will have documented procedures on how they must process consumer grievances. The following is the minimum process that should be implemented.

a) If a Beneficiary contacts the Vendor with a complaint, the Vendor will respond as quickly as is practically possible (within five days after receiving the complaint) and in a professional, courteous manner.

b) The Vendor should attempt to resolve the complaint to the satisfaction of both the customer and the Vendor within 21 days after receiving the complaint so that the Beneficiary has no need to take the grievance to Department of Energy.
c) The Vendor will document the complaint and will record relevant information, such as:
    - Name of Beneficiary;
    - Date complaint first made to the Vendor;
    - Date of purchase of the product;
    - Product Description;
    - Nature of the complaint;
    - Record all actions taken to solve the complaint; and
    - At the conclusion of the process, state the outcome.
d) If the complaint relates to a technical problem with the Product, the Vendor shall develop a series of questions to determine whether the issue is Beneficiary related or product failure.
    a. If the problem is Beneficiary related, the Vendor should explain to the Beneficiary in a professional and non-confrontational manner what the problem is and, if possible, how to remedy it.
    b. If the Product or a component within the product has failed and the Product (or component) is still covered by warranty, the Vendor shall replace the Product (component) .
    c. If the product or component within the product has failed and the product (or component) is outside the warranty period, the Vendor will offer a replacement product (or component) at the current price.
e) If the complaint relates to a Beneficiary service issue with the Vendor or one of their outer islands representatives, the Vendor should attempt to resolve the complaint to the satisfaction of both the Beneficiary and the Vendor within 21 days after receiving the complaint and prevent the customer taking the grievance to Department of Energy.

18. Grievance Procedure Against a Vendor

A grievance may be raised by Department of Energy (DoE) directly or by a Beneficiary.

With respect to the Department of Energy or the Beneficiary raising the grievance, examples could include, but not be limited, to:

- Vendor, despite having an excessive number of Products fail in the field and having a product removed from the product list, continues to promote the product.
- The DoE has raised concerns over actions undertaken by the Vendor that do not meet the SIA and/or relate to the Code of Conduct and the response from the Vendor has not been satisfactory. Examples of actions that might be considered unsatisfactory include but not limited to:
    - Vendor saying it is a Beneficiary problem but no documentary evidence on why they think that.
    - Vendor took weeks to respond to complaint and all follow up was not done in reasonable time (e.g. less than 1-2 weeks)
- The Vendor is suspected of acting fraudulently in the sale of Products and/or the claiming the subsidy. An example of this would be that, during the verification process, a sale was found not to have occurred and the receipt for this sale has been created to obtain the subsidy fraudulently.
- The Vendor supply chain is not operating as described in the Business Plan.
- The vendor has sold or signed-up customers to the Products under the Payment Plan above the maximum price that was provided to the DoE without providing sufficient justification.

Independent of where the grievance is raised the procedure shall be:

a) Initially the grievance to the DoE should be verbal and the DoE determines whether the complaint is frivolous, vexatious or motivated by professional rivalry. If the grievance is raised by DoE directly, then the process will proceed from d) below.

b) If the above (a) does not apply, the complainant will be asked to provide a written complaint to the DoE or, if this is not possible, the complainant should provide all the details verbally to a DoE officer and the DoE officer should make a written record of it. At the conclusion of the phone call the DoE should read back to complainant what they have written and have them verbally confirm what is written.

c) For each grievance received, the following information should be supplied by the complainant:
    i. Full contact details of all involved parties;
    ii. A description of the problem that has led to grievance;
    iii. All relevant information relating to any grievance;
    iv. Any actions taken to resolve the grievance;
    v. Full detail of all communication with the Vendor.

d) The DoE will pass the complaint to the Verification Agent to undertake the investigation and will form a grievance committee which will include a minimum of 3 people including the Director of DoE and at least one independent person. The committee's role, if required, will be to review the VA's recommendation resulting from the investigation.

e) The VA will write to the Vendor explaining the nature of the grievance and the Vendor has 14 days to respond to the complaint in writing. Where the Vendor's response leads to prompt resolution of the grievance, no further action will be taken.

f) Where the grievance cannot be immediately resolved, the VA will work with all parties to try and gain a satisfactory outcome. Where this is not possible, a recommendation for action will be made by the VA to the grievance committee to determine the appropriate response and action required to deal with all issues to the satisfaction of the parties involved.

g) The outcome might be that the Vendor is de-registered.

19. Grievance by a Vendor

A grievance may be raised by a Vendor or an applicant seeking to become a Vendor in relation to decisions made by DoE in respect of the SIA or the SIM. Examples could include, but not be limited, to:

- Vendor not satisfied when a product has not been approved by DoE.
- Vendor not satisfied when a system installation is not approved to receive a subsidy.
- Potential vendor not registered by DoE.

19.1 Complaint raise with Department of Energy

(1) A vendor or an applicant seeking to become a vendor aggrieved by a decision of the Department of Energy relating to VREP II, in relation to the SIA and the SIM may raise its grievance with the Department of Energy within 30 days of receiving the decision.

(2) When raising a grievance with the Department of Energy, the vendor must state:
- (a) why he or she is not satisfy with the decision of the Department of Energy;
- (b) why his or her product has to be approved to receive a subsidy;
- (c) why his or her company is not registered by DoE; and
- (d) the other reasons which may relate to the SIM and SIA which he or she is not happy with.

(3) If the Department of Energy receive a grievance within the required time, it must review all evidence supporting the grievance with 14 days and may:
- (a) revoke its previous decision;
- (b) amend or vary the decision; or
- (c) take no further action.

19.2 Review by the Grievance Board

(1) If a vendor or applicant seeking to become a vendor is not satisfied with the decision of the Department of Energy under subclause 1(3), the vendor may raise its grievance with the Grievance Board, through the Office of the Director General, within 14 days of receiving a decision of the Department of Energy.

(2) When lodging a grievance with the Board, the vender must provide the Board with the following information:
- (a) Full contact details of all involved parties;
- (b) A description of the problem that has led to grievance;
- (c) All relevant information relating to the grievance;
- (e) details of action taken to resolve the grievance and decision made by the Department of Energy under subclause 1(3);

(3) If the Board receives a grievance within the required time, it must review all evidence supporting the grievance including response from Department of Energy under subclause (4) and may:

(a) affirm the decision under review; or
(b) vary the decision under review; or
(c) set aside the decision under review and make a decision in substitution for it.

(4) Prior to taking any decision under subclause (3), the Board must write to the Department of Energy explaining the nature of the grievance and give the DoE 14 days to respond to the complaint in writing.

19.3 Copy of the Grievance Board's decisions and recommendation to be forwarded to World Bank.

If a party is still not satisfied with the decision of the Board, it must, within 14 days of the decision, request the Board through the office of the Director General, to forward a copy of the decision of the Board to the World Bank for further review and deliberation as part of the World Bank's Grievance Redress Mechanism. Information about submitting complains under the World Banks Grievance Redress Mechanism are provided in Section 5.15 of the VREP II Project Operations Manual

Part 1: General Information on Prospective Vendor

Name of Business Applying to be a Vendor

_____

Physical Address of Main Office/Shop

_____

_____

Postal address (ifdifferent)

_____

_____

Addresses of other business locations (attach separate page if insufficient space)

_____

_____

_____

_____

_____

Name of Contact

_____

Position

_____

7. Phone Number_____

8. Mobile Number_____

9. e-mail address_____

10. Website Address: _____

Is the business registered? Yes_____ No _____

Business registrationnumber

_____

13. Year Business Registered _____

Owner of Business, if different to contact person. Note if applicant is a company with directors, please name all directors.

_____

How long has this person owned the business?
_____Years

Does the business trade under any other name? Yes _____ No ____

If Yes, what othername(s)

_____

_____
_ Date of Application: _____

Part 2: Vendor Financial Capability

Please provide financial statements for the previous 3 years. For businesses of less than three (3) years of operations in Vanuatu, the vendor is required to provide DoE with evidence of its legal registration and to be accompanied by evidence of sufficient funds in its bank account, declaration of its liabilities or debts and projected financial statement for the next three (3) years based on its business.

Part 3: Business Plan

The prospective Vendor is to provide a business plan, which includes all the information requested in the SIM. As a minimum the business plan shall include:

Background information detailing the experience the Vendor has had supplying solar systems. This should include:

How many years the vendor has been supplying systems?

Have they been providing small solar plug/play systems and/or installing large systems?

State the approximate numbers of systems installed and, if involved with larger projects, provide a list of some examples.

How many staff is involved? what is their technical expertise and what, if any, training they have had?

Who will be responsible to manage the program within the applicant's business and how does participation in this program fit into the current structure and business activities? An organisational chart of the applicant business should be provided.

What islands does the Vendor intend to target for the distribution of these products?

Detail how the Vendor will distribute the eligible products to the various regions. This must include: listing all Vendor outlets/branches, any partnership agreements with other organisations, current and new dealers and/or details on any other distribution method they will be using.

For VREP II Component I installer: Where the Vendor will be installing the DC system the Vendor has provided name, number and certification of the Solar Technician. In addition, where the Vendor will be installing the AC system the Vendor has provided name , number, certification and license of the Electrical Technician.

How the Vendors propose to market their products?

If the applicant Vendor already has products, which they will submit for product registration for VREP I, based on the current exchange rates and freights costs, provide the wholesale price (vendors purchase price) and the maximum price (exclusive of VAT) of their products be for each of the Islands in which they will operate

If the applicant Vendor already has provide the maximum price (exclusive of VAT and installation) of their products will be for each of the Islands in which they will operate.

If the applicant will be installing systems under VREP II Component I, provide the estimated maximum installation price on the various islands.

The Vendor's spare parts policy and how they will manage servicing the products in the outer islands.

The process by which the Vendor will manage obtaining the customer's information and the receipt and declaration form as required according to the subsidy re-imbursement and verification process.
The Vendor's policy and procedure in meeting the Environmental Code of Practice.
The Vendor's grievance procedure as required by section 4.9 of the SIM. This procedure must include their returns policy and also how they will handle the replacement of products under warranty.

Vendor Application Process Checklist

Vendor Name: _____

Date of Application:_____

		Item	
		Application form is complete	
		Business is registered	
		3 year Financial Records provided or for businesses of less than three (3) years of operations in Vanuatu, the vendor is required to provide DoE with evidence of its legal registration and to be accompanied by evidence of sufficient funds in its bank account, declaration of its liabilities or debts and projected financial statement for the next three (3) years based on its business.	
		Business is solvent	
		Business Plan Provided and includes following:	
		Project Manager Named	
		The process showing the product supply operation will fit in current business is described?	
		The Islands where the vendor will operate is stated.	

		The Vendor has provided the details of an appropriate distribution plan for the products to these Islands	
		The vendor has a plan for marketing the products	
		If the applicant Vendor already has products, which they will submit for product registration	
		For VREP I Products: The Vendor has provided the wholesale price (vendors purchase price) and a maximum selling price (exclusive of VAT) for their product in each of the Islands where they propose to sell the products.	
		For VREP II Component I Products: The Vendor has provided the maximum selling price (exclusive of VAT and installation) for their product in each of the Islands where they propose to sell the products.	
		For VREP II Component I Products: Where the Vendor will be installing the system The Vendor has provided estimated maximum installation price on the various islands	

		The Vendor has a spare parts policy and has described how the products will be serviced in the outer islands.	
		The Vendor has described a suitable process by which they will manage to obtain the customer's information and the receipt copy as required according to the subsidy re-imbursement and verification process.	
		The Vendor has provided their policy and procedure in meeting the Environmental Code of Practice.	
		Number and names of Solar Technicians or Electrical Technicians and their expertise along with certification and licencse as appropriate.	
		Checklist, application paperwork and all other documentation have been stored in the Vendors file and a copy in the project file.	

Checked by: _____

Signed_____ _____

Date_____ _____

Is further information required? Yes/No

Date Request for Further Information Sent_____

Date further information received. _____

Recommendation- Approved/ Not Approved Reasons for Non-Approval

_____

_____

_____

_____

_____

_____

_____ Date of Approval:_____
Approved by: _____

Signed_____ _____

Product Application Form for VREP I

General Information on Vendor

Vendor's Business name or Name of Business Applying to be a Vendor

_____
___

Physical Address of Main Office/Shop

_____
___

_____
___

Postal address (if different)

_____
___

_____
___

Name of Contact

_____
___

Position

_____
___ 6. Phone Number _____
7. Mobile Number _____

8. e-mail address _____

9. Website _____

Product Information

Notes:
Product refers to a complete solar home system plug and play kit.
Submit a separate form for each product

List the name and product number of the plug and play product for which you are seeking approval for the product to be included in the Product catalogue
(Include data sheets and any relevant product catalogues with this application)

_____
_____

_____
_____

Provide the following information in relation to the product's Manufacturer.

Name of Manufacturer.

_____
_____

Product Manufacturer's Website:

_____
_____

Has the product been tested and certified in accordance to the Draft Lighting Global Solar Home Systems Minimum Quality Standard or Solar Home Systems Kit Quality Standards for Plug and Play Solar Home Systems?

Yes _____ No_____

Has the product been tested and certified in accordance to the Lighting Global Minimum Quality Standard or Pico-PV Quality Standards (Under 10W)?

Provide the Lighting Global Product Testing Verification letter (certificate)

Provide the Technical Specifications sheets as used by Lighting Global in their website.

Does each individual product come with a unique identifiable serial number of similar?

Yes_____ No _____
(Note there might be a serial number on the module and on the controller or interconnection Hub, it would be the one on the controller or interconnection Hub that would be used for verification purposes.

If yes, where is the serial number located?

_____

If no, the Vendor must explain how they will incorporate a unique serial number for each PRODUCT so that it can be recorded and tracked.

_____

_____

_____
What is the wholesale price (vendors purchase price) for the product?

_____ VATU

What is the selling price for the product in each of the Islands where you propose to sell the product:

Island_____ Selling Price _____ VATU

Island_____ Selling Price _____ VATU

Island_____ Selling Price _____ VATU

Island_____ Selling Price _____ VATU

Island_____ Selling Price _____ VATU

(add more as required)

Please provide the following information.

Number of Lights _____

Type of Light_____

Wattage Light 1 W

Wattage Light 2 W

Keep inserting a light number and its wattage for each light however if a number of lights have the same wattage than state how many lights with each wattage

Light Output per light _____
Must specify output in Lumens or Lux over a specified area
If different size lights than specify for each light.

Run Time per light per day _____ Hrs
If different run times for different lights than specify for each light.

Type of other appliances (if any) _____

Power Rating of Appliance _____ _____W

Run Time for appliance per day _____ Hrs

If more than one appliance then repeat the last 3 questions for each appliance

Does the product charge mobile phones? Yes ____ No ____
If Yes, how many mobile phone charging points? _____

PV Module Power Rating _____ W

Battery Type_____ _____

Battery Capacity _____ Ah

Battery Voltage _____ _V

Is this battery required to be collected and disposed of safely in accordance with the Environmental Code of Practice (ECOP)?

Yes _____ No _____

If yes, then how will this recycling process by managed by your company? The recycling process must also be detailed in your business plan as part of your vendor application.

Provide a copy of the user manual supplied by the manufacturer for each product.

List the spare parts that are available for the product and those that the Vendor will be providing. Include details of the Vendor's spare parts policy?

(Include a description of each spare part, state how many spare parts you will hold per 100 (or part thereof) systems and describe where the spare parts will be stored and how they will be distributed when required)

_____

_____

_____

_____

Date of Application: _____

23. Product Application Form for VREP II

General Information on Vendor

1. Vendor's Business name or Name of Business Applying to be a Vendor

_____

2. Physical Address of Main Office/Shop

_____

_____

3. Postal address (if different)

_____

_____

4. Name of Contact

_____

5. Position

_____

6. Phone Number _____

7. Mobile Number _____

8. e-mail address _____

9. Website _____

Product Information

10. List the System Size (In Peak Watts of the solar array)

11. Provide the following information in relation to the individual equipment:
(Include data sheets and any relevant product catalogues with this application)

Solar Module:
Name of Manufacturer:
Model Number:
Rating in Watts:
Manufacturer's Warranty:
Number of Cells:
Number of Modules in Array:
Number in of module in a string:
Number of parallel strings:
Total Rating of Array in Watts:

Solar Array Frame
Name of Manufacturer:
Model Number:
Type: Roof or Pole Mount?

Solar Controller:
Name of Manufacturer:
Model Number:
Manufacturers' Warranty:
Type: MPPT or PWM
Rating in Amps:
Input DC Voltage:

Battery:
Name of Manufacturer:
Model Number:
Rating in Ah of each battery:
Manufacturer's Warranty:
Number of Batteries in Battery Bank:
Number in of batteries in a string:
Number of parallel strings:
Voltage of Battery Bank:
Overall Capacity Rating of Battery Bank (Ah):

Inverter:
Name of Manufacturer:
Model Number:
Manufacturer's Warranty:
Type: Sine or Modified Sine
Isolation: Does the inverter have simple isolation between AC and DC sides
Rating in Watts/Volt Amps:
Input DC Voltage:

Control Board or Enclosure:
Is there fuses for the DC loads or foes it rely in controller? _____
If fuses, the number and ratings?
Are there power outlets for the AC and if so how many?
Are they protected by a circuit breaker and if so how what rating?

12. Has the individual items of equipment been tested and certified and if so List the standards certified against and whether test certificates have been supplied.

Equipment	**Tested and Certified (yes/no)**	**Standard Tested Against**	**Test Certificate Provided (Yes/No)**
Module			
Battery			
Solar controller			
Inverter			
Control board or enclosure		**AS/NZS3000**	

13. What is the daily energy output of the system at either the DC output terminals of solar controller or the AC output of the Inverter. If both list daily energy contribution for both:

Daily DC Output Energy_____Wh

Daily AC Output Energy_____ ___Wh

Total Daily Output Energy_____ _____Wh

14. How many days of autonomy for the selected battery capacity?
_____Days

15. Does each individual product come with a unique identifiable serial number of similar?
Yes_____ No _____

16. What is the selling price for the product in each of the Islands where you propose to sell the product:

Island_____ _____ Selling Price _____ _____ VATU

Island_____ _____ Selling Price _____ _____ VATU

Island_____ _____ Selling Price _____ _____ VATU

Island_____ _____ Selling Price _____ _____VATU

Island_____ _____ Selling Price _____ _____ VATU

(add more as required)

17. What is the manufacturer's warranty of the individual equipment:

Module _____ _____ years
Battery _____ _____ _____years

Controller _____ _____ years
Inverter _____ ____years

18. For Preassembled Solar Home System Kits provide a copy of the Inspection and Test Certificate (Section 35) and the details of the Solar or Electrical Technician.

19. For systems to be installed by Vendor but with in-house constructed control boards or enclosure provide a copy of the Inspection and Test Certificate (Section 36) and the name of of the Solar or Electrical Techncian.

20. Provide a copy of the user manual

Date of Application: _____

24. Product Application Checklist for VREP I

This section is removed from this verions of the ISM however the title is retained for ease of cross reference with past versions of this SIM document.

25. Product Application Checklist for VREP II

Use one of these forms for each product application.

Vendor Name: _____

System Size: _____

Date of Application:_____

Application Form compliance

No	Item	Check
1	Application form is complete	

Equipment Compliance and System Performance

No	Item	Check
2	Equipment meets standards:	
	Module	
	Battery	
	Solar Controller	
	Inverter	
3	Test certificates provided:	
	Module	
	Battery	
	Solar Controller	
	Inverter	
	Control board or enclosure	
4	Warranties	
	Module 10 years	
	Battery 2 years	
	Solar Controller 2 years	
	Inverter 2 years	
5	Daily Energy Output provided	
	Energy output meets design guidelines	
6	Battery Days of Autonomy Provided	
	Days of autonomy meet guidelines	
7	For Preassembled Solar Home System Kits Inspection and Test Certificate and details of Solar or Electrical Technician provided.	

8	For Systems to be installed by Vendor Inspection and Test Certificate provided for control board/enclosure and details of Solar or Electrical Technician provided (if applicable)	

Prices Provided

No	Item	Check
10	Selling Price provided for each of the Islands where the Vendor is Operating	

Manual

No	Item	Check
11	Manual has been provided	

Checked by: _____

Signed_____ _____ ____

Date_____ _____ _____

Recommendation- Approved/ Not Approved

Reasons for Non-Approval

_____

_____

_____

_____

_____

_____

No	Item	Yes/No or Date
12	If the product is approved:	
a	Write a letter to the Vendor:	
	v. informing them of the approval. vi. asking for photos and other information required for the product catalogue.	

	vii. Confirming the maximum price, the product will be sold in area they are operating in. viii. Requesting the final version of the manual as specified within the SIM	
	Date Letter Sent	
b	Full manual has been submitted comprising:	
	For Preassembled SHS Kits: How to correctly install the solar module so that it receives direct sun each day and is not shaded	
	How to correctly install the controller, battery, lights and any other appliance, ensuring that there is no possibility of incorrectly connecting the battery bank	
	How to maintain the system and in particular hoe to keep the modules clean	
	How to correctly use the system, in particular with respect to the hours of usage of each of the lights and other appliances	
	The Vendors returns policy	
	The Warranty of the product	
	How to dispose of the used battery when requiring a replacement.	
b	Add the product details to the product catalogue. (Go to end of table)	
13	If the product is not approved:	
a	Write a letter to the Vendor:	
	iv. Date Vendor Contacted Informing them of why it is not approved. v. stating that they have 14 days to respond. vi. based on the response either approve the product or the product remains unapproved.	
	Date Letter Sent	
	Date response received	
b	Based on the response either approve the product or the product remains unapproved (If unapproved go to end of table)	
c	If the product is approved:	
	Write a letter to the Vendor:	
	v. informing them of the approval. vi. asking for photos and other information required for the product catalogue. vii. Confirming the maximum price the product will be sold in area they are operating in. viii. Requesting the final version of the manual as specified within the SIM	
	Date Letter Sent	

d.1	**Preassembled Solar Home System Kits** Full manual has been submitted comprising:	
	Copy of the load assessment sheet.	
	How to correctly install the solar module so that it receives sun each day and is not shaded.	
	How to correctly install the control board or enclosure.	
	How to correctly install the battery.	
	How to interconnect the solar module, the control board or enclosure and the battery.	
	A description of the operation of the system and how to correctly use the system, particularly with respect to the hours of usage of each of the lights and other appliances (this should be provided in local language)	
	List of equipment supplied.	
	Shutdown and isolation procedure for emergency and maintenance.	
	Maintenance procedure and timetable.	
	Commissioning records and installation checklist.	
	Warranty information for the whole system and each item of equipment.	
	System connection diagram.	
	Equipment manufacturers documentation and handbooks for all equipment supplied.	
	The Vendor's returns policy.	
	How to dispose of the used battery when requiring a replacement. and/or the process of how to return the used battery to the Vendor for recycling.	
	Electrical Safety brochure.	
	Grievance redress process.	
d.2	**Solar Home Systems and micro grid systems to be installed by Vendor** Full manual has been submitted comprising:	
	Copy of the load assessment sheet.	
	A description of the operation of the system and how to correctly use the system, particularly with respect to the hours of usage of each of the lights and other appliances (this should be provided in local language)	
	List of equipment supplied.	
	Shutdown and isolation procedure for emergency and maintenance.	
	Maintenance procedure and timetable.	
	Commissioning records and installation checklist.	
	Warranty information for the whole system and each item of equipment.	
	System connection diagram.	
	Equipment manufacturers documentation and handbooks for all equipment supplied.	

	The Vendor's returns policy.	
	How to dispose of the used battery when requiring a replacement. and/or the process of how to return the used battery to the Vendor for recycling.	
	Electrical Safety brochure.	
	Grievance redress process.	
e	Add the product details to the product catalogue.	
14	Checklist, application paperwork and all other documentation have been stored in the Vendors file and a copy in the project file.	

Date of Approval: _____

Approved by: _____

Signed_____ _____ ____

Notification of Product Purchased Form (VREP I)

This section is no longer relevant to VREP II component I. However, the section title is retained to allow ease of cross reference to previous versions of this document.

26. Customer Declaration Form

I, _____ (insert name)

Householder/Responsible person/Agent (cross out if does not apply)

Of/For_____
include Insert Householders/Responsible Person's Name, Village and Island Name

Declare that

1. That the system purchased is being used to provide lighting and other services (if relevant at my_____ (complete if applicable) household/business/public intuition hall (strike out what is not relevant) in _____ _____ (state village name) and
2. That the vendor has fully explained their company's policy and the product's warranty terms and has provided information on how to dispose of the used battery when purchasing a new one.

Signed_____

Date _____

27. System Design Declaration Form

Selection of System

DC Only System:

A) Total DC energy required per day from energy assessment =_____ Wh

Derating factor due to shade = _____ (enter 1 if no derating)

Derating factor due to orientation/tilt =_____(enter 1 if no derating)

Total energy supplied by solar system offered as per Product catalogue = ____ Wh

B) Total energy supplied by solar system offered as per Product catalogue = ____ Wh

B must be greater than A

AC Only System

A) Total AC energy required per day from energy assessment =_____ Wh

Derating factor due to shade = _____ (enter 1 if no derating)

Derating factor due to orientation/tilt =_____(enter 1 if no derating)

Total energy supplied by solar system offered as per Product catalogue = ____ Wh

B) Total energy supplied by solar system offered as per Product catalogue = ____ Wh

B must be greater than A

Combined AC and DC Systems

Total DC energy required per day from energy assessment = _____ Wh

Total AC energy required per day from energy assessment = _____ Wh

AC Load energy at Battery = AC Load energy/ 0.9 (Inverter Efficiency) = ____ Wh

A) Total Energy Required by per day = Total DC energy required + AC Load energy at Battery

Derating factor due to shade_____ (enter 1 if no derating)

Derating factor due to orientation/tilt = _____ (enter 1 if no derating)
=

Total energy supplied by solar system offered as per Product catalogue= ____ Wh

B) Total energy supplied by solar system offered as per Product catalogue= ____ Wh

B must be greater than A
It is understood that the DC loads do not include inverter efficiency butthis will be allowed as a safety margin

Maximum DC Charge Current of Battery

DC Only System:

DC Maximum Demand from energy assessment = ____ W

System Voltage =_____ V

A) Maximum Discharge Current from Battery = _____ A (W/V)

B) C_5 current of selected battery = _____ A

B must be greater than A

AC Only System

AC Maximum Demand from energy assessment =_____ Volt Amps

System Voltage =_____ V

Inverter Efficiency = 0.9

A) Maximum Discharge Current from Battery = _____ A (Volt Amps/ (0.9 x V))

B) C_5 current of selected battery = _____A

B must be greater than A

Combined AC and DC Systems
DC Maximum Demand from energy assessment= ____ W

System Voltage =_____ V

A DC Discharge Current Discharge from Battery =_____ A (W/V)

AC Maximum Demand from energy assessment = ____ Volt Amps

Inverter Efficiency = 0.9

B) AC Discharge Current from Battery =_____ A (Volt Amps/ (0.9 x V))

C) C_5 current of selected battery = _____ A

=

C must be greater than A + B

System Design Declaration

Name of Vendor _____

I certify that the system selected meets the energy demand of the Beneficiary as determined in the above load assessment forms

Signature _____

Name of Person Signing _____

Date _____

29.1 Subsidy Re-imbursement Application FormsVREP II Component I Subsidy Re-Imbursement Application Form

Name of Vendor

_____

Contact Person responsible for the Subsidy Re-Imbursement Application

_____

Phone Number _____

Mobile Number _____

e-mail address _____

Number of products sold or signed-up eligible for subsidy
_____

Total value of subsidy being Claimed _____

Each of the following is included with the application:

1. The Excel product sales database with the file name containing the name of the Vendor, the word subsidy and date subsidy re-imbursement is submitted e.g. *VendorNameSubsidyVREPII 060917*.
2. For each product sold where a subsidy is being claimed, a copy of the receipt, signed by the customer that includes the full price of the product sold and the actual price paid by the customer. For products sold through Payment Plan, a copy of the receipt or documentations of the first deposit, signed by the customer and information on Payment Plan arrangement.
3. For each product sold where a subsidy is being claimed, a copy of the required declaration form or some documentations demonstrating the customer declaration.
4. For each product sold or signed-up through Payment Plan where a subsidy is being claimed, a copy of the load assessment form.
5. For each product sold or signed-up through Payment Plan where a subsidy is being claimed a copy of the Solar Design Declaration.
6. For each product sold or signed-up through Payment Plan where a subsidy is being claimed and system installed by vendor a copy of the Installation Inspection and Test Sheet.
7. For each product sold or signed-up through Payment Plan where a subsidy is being claimed and system installed by vendor a copy of the DC Wiring Inspection and Test Certificate (If applicable)

8. For each product sold or signed-up through Payment Plan where a subsidy is being claimed and system installed by vendor a copy of the AC Wiring Inspection and Test Certificate (If applicable)
9. For each product sold or signed-up through Payment Plan where a subsidy is being claimed and system installed by vendor a copy of photos as specified in section 13.2.
10. The grievance database with the file name containing the name of the Vendor, the word grievance and date subsidy re-imbursement is submitted e.g. *VendorNameGrievance VREPII 060917*.
11. Photos showing completeness of installation as per SEIAPI installation guidelines. Photos must be geo-tagged showing coordinates of installation and the recipient must be within the photos (for vendor-installed systems).

The two required databases mentioned in Nos. 1 and 6 above can either be provided on a memory stick with this form or sent via e-mail to Director Department of Energy Email: gantony@vanuatu.gov.vu or the Program Manager, Department of Energy Email: vrep@vanuatu.gov.vu

Date of Application: _____

30. Subsidy Re-Imbursement Checklist for DoE

Name of Vendor

_____

Date Re-Imbursement Application Received_____ _____ ____

What is the total number of products sold or signed-up?
_____

What is the total value of the subsidy being claimed? _____

No	Item	Check
1	A Copy of The completed subsidy re-imbursement application form is kept in the vendors file.	
2	Copies of the excel sales and grievance databases are kept electronically.	

Confirm the following is sent to the VA.

No	Item	Check
7	For VREP II For each product where a subsidy reimbursement is being claimed a Copy of load assessment form is provided. If not relevant, state N/A.	
8	For VREP II For each product where a subsidy reimbursement is being claimed a copy of load signed System Design Declaration Form. If not relevant, state N/A.	
9	For VREP II	

	For each product installed by Vendor where a subsidy reimbursement is being claimed a copy of the Installation Inspection and Test Sheets, and photos	
10	For VREP II For each product installed by Vendor where a subsidy reimbursement is being claimed a copy of the DC Wiring Inspection and Test Certificate and details of Solar Technician.	
11	For VREP II For each product installed by Vendor where a subsidy reimbursement is being claimed a copy of the AC Wiring Inspection and Test Certificate and details of Electrical Technician.	
12	For VREP II For each product installed by Vendor where a subsidy reimbursement is being claimed a copy of the system photos as requested in section 13.2	
13	The Excel grievance database	
14	Are photos of installations provided to assist with verification (for vendor installed jobs)	

Checked by _____ _____ ____

Signed _____ _____

Date Sent to VA _____

Upon receipt of OVR report complete the following:

Date Output Verification Report (OVR) Received _____

Had the OVR been delayed because VA had to contact Vendor for further information? _____

Were there any systems that the VA did not think should receive the subsidy?

If so, why not?

_____

_____ _____

_____

_____ _____

Actions Required

No	Item	Yes/No or Date
1	If the report recommends paying the subsidy:	
a	Pay the Vendor the subsidy re-imbursement from the Designated Account	
	Date Vendor Paid	
b	Database that is monitoring the total number and value of subsidies paid has been updated	
2	If the report recommends not to pay the subsidy or part of the subsidy	
a	Vendor contacted in writing detailing why the subsidy is not being paid.	
	Date Vendor Contacted	
	Vendor Responded	
	Date Vendor Responded	
b	Decision made on whether to pay, partly pay or not pay subsidy?	
c	If paid, Database that is monitoring the total number and value of subsidies paid has been updated	
3	Checklist, application paperwork and all other documentation have been stored in the Vendors file and a copy in the project file.	

Checked by _____ _____

Signed _____ _____

Dated_____ _____

31. Subsidy Re-Imbursement Checklist for VA

Name of Vendor

_____

Date Re-Imbursement Application Received_____ _____ ____

What is the total number of products sold or signed-up?
_____

What is the total value of the subsidy being claimed? _____

Subsidy Re-Imbursement Application

No	Item	Check
1	Subsidy re-imbursement application form correctly completed	
2	Excel product sales database has been provided and is complete	
3	The total number of sales or signed-up on the application form matches the number of sales or signed-up listed in the sales database	
4	All products sold or signed-up are in the product catalogue	
5	The value of subsidy being claimed on the application form matches the total value on the sales database	
6	The number of receipts provided matches those indicated in the sales database	
6a	Are all the receipts provided? (Yes/No)	
7	The number of signed declaration or documentation forms provided matches those indicated in the sales database	
7a	Have all the signed declarations or documents been provided (Yes/No)	
8	Store the Copies of: all completed Notification of Product Purchased forms; Invoices from Manufacturers and shipping and customs documents that have been supplied to the DoE since the last subsidy claim by that Vendor, in the relevant file for that vendor. If not relevant, state N/A.	
9	Serial numbers supplied with sales database and the receipts match those supplied on the Notification of Product Purchased Forms that have been previously supplied by that Vendor?	
10	All serial numbers are unique and have not been used previously?	

11	The total sales price on the receipts is equal to or less than the maximum price shown on the relevant Notification of Products Purchased form.	
12	The last sales database supplied by the Vendor with the previous subsidy re-imbursement claims and ensure that if there have been any outstanding receipts and/or declaration forms that these have been received.	
13	If any of the information provided by the Vendor appears to be incorrect or confusing in any way, the VA has contacted the Vendor for clarification.	
	If applicable, outcome has been recorded in OVR	
14	For VREP II applications: For each System Design Declaration Form the total daily Load energy determined in load assessment form is less than the designed daily energy output of the system provided.	
15	For VREP II applications: For each System Design Declaration Form the total demand current is equal to or less than the C_5 current of the battery.	
16	For VREP II applications: For each Product installed by the Vendor the Installation Inspection and Test Sheets have been completed correctly and system has been installed in accordance to the requirements of the SIM (including detail of Solar/Eletrical Technicians). Note: Verification also includes checking the photos provided.	
17	For VREP II applications: For each Product installed by the Vendor and where applicable the DC Wring Installation Inspection and Test Certificates including Solar Technician's details have been completed correctly	
18	For VREP II applications: For each Product installed by the Vendor and where applicable the AC Wring Installation Inspection and Test Certificates including Electrical Technician's details have been completed correctly	

19	**Solar Home Systems** for VREP II Component I 50% of Beneficiaries have been contacted by phone or verified through photos of vendor-installed system	
	Microgrid systems for VREP II Component I 100% of Beneficiaries have been verified by phone or through review of photos of vendor-installed system.	
20	If through phone verification one of the beneficiary's did not purchase or signed-up to a product--100% of phone verification has been undertaken	

Processing Grievance Data Base

No	Item	Check
1	The grievance database has been provided	
2	Review data base and state:	
3	What is the total number of grievances shown?	
4	The project's grievance database is updated with the information provided by the vendor	
5	What is the total % of grievances for the Vendor with respect to their number of products provided?	
6	Should the Vendor be question further about the grievances? If yes, include outcome in Output Verification Report	
7	The project Grievance data base has been updated such that: I. Vendors data base been copied and pasted into the worksheet for that specific Vendor II. Vendors data base been copied and pasted into the first worksheet providing the summary of all the reported grievances	

Verification Report Process

No	Item	Check
1	Output Verification Report completed	
2	If subsidy reimbursement has been recommended than the project sales database has been updated I. Vendors data base been copied and pasted into the worksheet for that specific Vendor	

	II. Vendors data base been copied and pasted into the first worksheet providing the summary of all the sales.	
3	OVR and the 2 updated project databases have been submitted to DoE	

Completed by_____ _____ ____

Signed_____ _____ _____

Dated_____

32. Load Assessment Form- Sample

Table 1 DC Load (energy) Assessment

Appliance	Number	Power (W)	Operating Hours Per Day (H)	Energy Usage Per Day (Wh)	Contribution to Maximum Demand (W)	Comments
Total DC energy required per day						
DC Maximum Demand						

Table 2 AC Load (energy) Assessment

Appliance	Number	Power (W)	Operating Hours Per Day (h)	Energy usage per day (Wh)	Power Factor	Contribution to Maximum Demand (Volt Amps)	Surge Factor	Contribution to Surge Demand (VA)	Comments
Total AC energy required per day									
AC Maximum Demand									
AC Surge Demand									

33. Voltage Drop Tables

Distance in metres to have 3% Voltage Drop with 12V systems							
	Cable Size (mm^2)						
Current (A)	1	1.5	2.5	4	6	10	16
1	9.8	14.8	24.6	39.3	59.0	98.4	157.4
2	4.9	7.4	12.3	19.7	29.5	49.2	78.7
3	3.3	4.9	8.2	13.1	19.7	32.8	52.5
4	2.5	3.7	6.1	9.8	14.8	24.6	39.3
5	2.0	3.0	4.9	7.9	11.8	19.7	31.5
6	1.6	2.5	4.1	6.6	9.8	16.4	26.2
7	1.4	2.1	3.5	5.6	8.4	14.1	22.5
8	1.2	1.8	3.1	4.9	7.4	12.3	19.7
9	1.1	1.6	2.7	4.4	6.6	10.9	17.5
10	1.0	1.5	2.5	3.9	5.9	9.8	15.7
11	0.9	1.3	2.2	3.6	5.4	8.9	14.3
12	0.8	1.2	2.0	3.3	4.9	8.2	13.1
13		1.1	1.9	3.0	4.5	7.6	12.1
14		1.1	1.8	2.8	4.2	7.0	11.2
15		1.0	1.6	2.6	3.9	6.6	10.5
16		0.9	1.5	2.5	3.7	6.1	9.8
17			1.4	2.3	3.5	5.8	9.3
18			1.4	2.2	3.3	5.5	8.7
19			1.3	2.1	3.1	5.2	8.3
20			1.2	2.0	3.0	4.9	7.9

34. Effect of Tilt and Orientation on Irradiation

ANNUAL DAILY IRRADIATION ON AN INCLINED PLANE EXPRESSED AS % OF MAXIMUM VALUE FOR CAIRNS Latitude: 16 degrees 52 minutes South Longitude: 145 degrees 44 minutes East										
	Plane Inclination (degrees)									
Plane Azimuth (degrees)	0	10	20	30	40	50	60	70	80	90
0	95%	99%	100%	99%	96%	90%	82%	73%	62%	52%
10	95%	99%	100%	99%	95%	90%	82%	73%	62%	52%
20	95%	98%	100%	98%	95%	90%	82%	73%	63%	53%
30	95%	98%	99%	98%	94%	89%	82%	73%	64%	54%
40	95%	98%	99%	97%	94%	88%	81%	73%	64%	55%
50	95%	97%	98%	96%	93%	87%	80%	73%	64%	56%
60	95%	97%	97%	95%	91%	86%	79%	72%	64%	56%
70	95%	96%	96%	94%	90%	84%	78%	71%	63%	55%
80	95%	96%	95%	92%	88%	82%	76%	69%	62%	54%
90	95%	95%	94%	90%	85%	80%	74%	67%	60%	53%
100	95%	95%	92%	89%	83%	78%	71%	64%	58%	51%
110	95%	94%	91%	87%	81%	75%	68%	61%	54%	48%
120	95%	94%	90%	85%	79%	72%	65%	58%	51%	45%
130	95%	93%	89%	83%	76%	69%	62%	54%	48%	41%
140	95%	93%	88%	82%	74%	66%	58%	50%	44%	38%
150	95%	92%	87%	80%	72%	63%	55%	47%	40%	35%
160	95%	92%	87%	79%	71%	61%	52%	45%	38%	33%
170	95%	92%	87%	79%	70%	60%	51%	44%	37%	31%
180	95%	92%	86%	79%	69%	60%	51%	43%	36%	31%
190	95%	92%	87%	79%	70%	60%	51%	44%	37%	31%
200	95%	92%	87%	80%	71%	62%	53%	45%	38%	33%
210	95%	92%	88%	81%	73%	64%	55%	48%	41%	36%
220	95%	93%	88%	82%	75%	67%	59%	51%	45%	39%
230	95%	93%	89%	83%	77%	69%	62%	55%	48%	42%
240	95%	94%	90%	85%	79%	73%	65%	59%	52%	46%
250	95%	94%	91%	87%	81%	75%	69%	62%	55%	49%
260	95%	95%	93%	89%	84%	78%	72%	65%	58%	51%
270	95%	95%	94%	91%	86%	80%	74%	67%	61%	53%
280	95%	96%	95%	92%	88%	83%	76%	69%	62%	55%
290	95%	97%	96%	94%	90%	84%	78%	71%	63%	55%
300	95%	97%	97%	95%	91%	86%	79%	72%	64%	56%
310	95%	98%	98%	96%	93%	87%	80%	73%	64%	55%
320	95%	98%	99%	97%	94%	88%	81%	73%	64%	55%
330	95%	98%	99%	98%	94%	89%	81%	73%	63%	54%
340	95%	98%	100%	98%	95%	90%	82%	73%	63%	53%
350	95%	99%	100%	99%	95%	90%	82%	73%	62%	52%

35. Preassembled Solar Home System Kit Test Certificate

Instructions. Where there is a statement of question either place tick (or Y) or cross (or N)

PV ARRAY

Solar Module Manufacturer	
Model Number	
Rating in Watts	W
Number of Modules in Array	
Number of modules in a string	
Number of parallel strings	
Total Rating of Array in Watts	W
Serial Numbers	
V_{oc} of Array at 10°C	V
I_{sc} of Array at 25°C	A

PV Array Mounting

Roof or Pole	
Manufacturer	
No galvanically dissimilar metals between the array frame and module	

Array Cabling

Size of cable	mm^2
Length of Cable to Controller	m
The Voltage Drop (based on I_{Sc} current and V_{mp} voltage for MPPT Controllers and based on typical maximum charge current and nominal battery voltage for standard controllers) between the array and controller	V %
Cable clips are provided	

Conduit is provided for the cable near roof edges	

Solar Controller

Name of Manufacturer	
Model Number	
Type MPPT or PWM	
Serial Number	
Input Current Rating	A
Input DC Voltage	V
Output Current Rating in Amps	A
Output DC Voltage	V
Maximum Output Charging Current with selected Array	A
Does the controller have protection for the DC loads?	
If so what is the current rating?	A
What size cable is connected to the DC load circuits?	mm^2

Battery

Name of Manufacturer	
Model Number	
Voltage of each Battery	V
Capacity Rating of each Battery	Ah
Number of Batteries in Battery Bank	
Serial Numbers	
Does each battery have a date stamp and if so enter the date(s)	
Number of batteries in a string	
Number of parallel strings	
Voltage of Battery Bank	
Overall Capacity Rating of Battery Bank	Ah
The Battery is housed in an enclosure or box	

Fuses are mounted in enclosure/box		
Rating of fuses		A
Fuses are mounted 100mm below top of battery enclosure?		
Fuses mounted on a wall face with no vents		
Battery enclosure has vents as follows		
Inlet vent mounted on a side wall at bottom		
Area of Vent		mm^2
Outlet vent mounted on opposite side wall at top		
or		
Outlet vent mounted on same side wall at top and the enclosure lid slopes up with highest wall the side that vents are on		
Area of Vent		mm^2
Vent sizes meet the requirements as specified in PPA/SEIAPI guidelines		
There is nothing mounted above the battery enclosure		
Insulation covers provided for the terminals on the batteries		
The size of the cable from battery to controller		mm^2
The length of this cable		m
The maximum charge current		A
The maximum discharge current		A
What is the Voltage Drop (based on max current and nominal battery voltage		V
		%
Cable clips are provided		
There is a no smoking sign or risk of battery explosion sign on the battery enclosure?		

Inverter

Name of Manufacturer	
Model Number	
Type Sine or Modified Sine	
Serial Number	
Isolation The inverter has simple isolation between AC and DC sides?	
Output Power Rating Watts or VA	Watts or Volt Amps
Input DC Voltage	V

Control Board or Enclosure

There are fuses or suitably rated circuit breakers for the DC loads	
If not is the protection in controller?	
If fuses, is there just one	
If more than one how many?	
Fuse or circuit breaker ratings=	A
Are there power outlets for the AC?	
If yes how many?_____	
Are they protected by a circuit breaker?	
If yes, What is the rating?_____	A
Controller is mounted in accordance with manufacturers recommendations	
Controller is mounted in accordance with manufacturers recommendations	
All wiring has been installed in accordance with the requirements of AS/NZS3000 or the European Standard and in particular:	
Cables are sized to carry the required current and voltage.	
All cables are electrically protected or will be upon final installation of system.	
DC and AC wiring are segregated	

System Test & Commissioning

Continuity Check

Solar Array to Controller

Cable from array to controller (including isolator if one installed) are provided with plugs to ensure correct polarity	

Battery to Controller

Cable from battery bank output to fuses provided with clear instructions to ensure correct polarity	
Cable from fuses to controller provided with clear instructions to ensure correct polarity	

Controller to Load Connection Point

Cable to connection point provided with clear instructions to ensure correct polarity	

Battery to Inverter (if applicable)

Cable to Inverter is continuous and has correct polarity	

System Test Readings

Solar Array to Controller

Measured open circuit voltage of each string (add if more strings)	
String 1 V_{oc}	V
String 2 V_{oc}	V
Measured Short circuit current of each string	
String 1 I_{sc}	A
String 2 I_{sc}	A
Description of conditions- e.g. Sunny Day, early or late in day etc.	

Array open circuit voltage at controller (prior to connecting to controller or controller turned on)	V
Array short circuit current at controller (prior to connecting to controller or controller being turned on)	A
Array voltage at controller when system operating	V
Array current when system operating	A

Battery to Controller when the system is fully connected but no loads on.

Battery voltage of each string	
String 1	V

String 2	V
Battery Bank Voltage at Controller	V

Controller to Load Connection Point with no load

Voltage at load connection point	V

I the undersigned verify that the preassembled solar home system kit being provided meets all the requirements of the SIM and is safe to be installed by the Beneficiary.

Name of Person Conducting Inspection and Test_____ _____

Electrical Licence- country issued and number_____ _____

Signature_____

Date_____ _____ _____

36. Control Board Inspection and Test Certificate

There are fuses or suitably rated circuit breakers for the DC loads	
If not is the protection in controller?	
If fuses, is there just one	
If more than one how many?	
Fuse or circuit breaker ratings=	A
Are there power outlets for the AC?	
If yes how many?_____	
Are they protected by a circuit breaker?	
If yes, What is the rating?_____	A
Controller is mounted in accordance with manufacturers recommendations	
Controller is mounted in accordance with manufacturers recommendations	
All wiring has been installed in accordance with the requirements of AS/NZS3000 or the European Standard and in particular:	
Cables are sized to carry the required current and voltage.	

All cables are electrically protected or will be upon final installation of system.	
DC and AC wiring are segregated	

I (insert name) verify that the enclosure being provided is safe and meets all the requirements of the SIM.

Name of Person Conducting Inspection and Test_____ _____

Electrical Licence- country issued and number_____ _____

Signature_____

Date_____ _____ _____

37. System Installation Inspection and Test Sheets

Name of Customer_____

Location of House/business/public institution_____

Instructions. Where there is a statement of question either place tick (or Y) or cross (or N)

System Inspection

PV ARRAY

Solar Module Manufacturer	
Model Number	
Rating in Watts	W
Number of Modules in Array	
Number of modules in a string	
Number of parallel strings	
Total Rating of Array in Watts	W
Serial Numbers	
V_{oc} of Array at 10°C	V
I_{sc} of Array at 25°C	A
Orientation of Array Degrees	Degrees
Array Tilt Angle Degrees	Degrees

PV Array Mounting

Roof or Pole		
Manufacturer		
Array securely fastened		
No galvanically dissimilar metals touching the array frame and/or module		

Array Cabling

Size of cable	mm^2
Length of Cable to Controller	m
The Voltage Drop (based on I_{Sc} current and V_{mp} voltage) between the array and controller	V
	%
Cabling is mechanically supported	
There are no loops which could easily be pulled and damaged	
Any cable near roof edges is mechanically protected	

Solar Controller

Name of Manufacturer		
Model Number		
Type MPPT or PWM		
Serial Number		
Input Current Rating		A
Input DC Voltage		V
Output Current Rating in Amps		A
Output DC Voltage		V
Maximum Output Charging Current with selected Array		A
Does the controller have protection for the DC loads?		
If so what is the current rating?		A
What size cable is connected to the DC load circuits?		mm^2

Battery

Name of Manufacturer	
Model Number	
Voltage of each Battery	V
Capacity Rating of each Battery	Ah
Number of Batteries in Battery Bank	

Serial Numbers	
Does each battery have a date stamp and if so enter the date(s)	
Number of batteries in a string	
Number of parallel strings	
Voltage of Battery Bank	
Overall Capacity Rating of Battery Bank	Ah
The Battery is housed in an enclosure or box	
Fuses are installed protecting battery output cable to controller or control board/enclosure?	
Rating of fuses	A
Fuses are mounted either more than 500mm away in horizontal direction or 100mm below top of battery enclosure?	
Fuses mounted on enclosure are mounted on a wall face with no vents	
Battery enclosure has vents as follows	
Inlet vent mounted on a side wall at bottom	
Area of Vent	mm^2
Outlet vent mounted on opposite side wall at top	
or	
Outlet vent mounted on same side wall at top and the enclosure lid slopes up with highest wall the side that vents are on	
Area of Vent	mm^2
Vent sizes meet the requirements as specified in PPA/SEIAPI guidelines	
There is nothing mounted above the battery enclosure	
The terminals on the batteries are insulated	
The size of the cable from battery to controller	mm^2
The length of this cable	m
The maximum charge current	A
The maximum discharge current	A
What is the Voltage Drop (based on max current and nominal battery voltage	V %
Cabling is mechanically supported	
There are no loops which could easily be pulled and damaged	
There is a no smoking sign or risk of battery explosion sign near the battery enclosure?	

Inverter

Name of Manufacturer	
Model Number	
Type Sine or Modified Sine	
Serial Number	
Isolation The inverter has simple isolation between AC and DC sides?	
Output Power Rating Watts or VA	Watts or Volt Amps
Input DC Voltage	V

Control Board or Enclosure

There are fuses or suitably rated circuit breakers for the DC loads	
If not is the protection in controller?	
If fuses, is there just one	
If more than one how many?	
Fuse or circuit breaker ratings=	A
Are there power outlets for the AC?	
If yes how many?_____	
Are they protected by a circuit breaker or RCD? Please state which device	
If yes, What is the rating?_____	A
If RCD has bonding earth been installed?	
Controller is mounted in accordance with manufacturers recommendations	
Controller is mounted in accordance with manufacturers recommendations	

System Test & Commissioning

Continuity Check

Solar Array to Controller

Modules in each string are connected in series correctly	
Strings connected in parallel have correct polarity	
Cable from array to controller (including isolator if one installed) continuous and correct polarity	

Battery to Controller

Batteries in a string are connected in series correctly	
Strings connected in parallel have correct polarity	
Cable from battery bank output to fuses continuous and has correct polarity	
Cable from fuses to controller continuous and has correct polarity	

Controller to Load Connection Point

Cable to connection point continuous and has correct polarity	

Battery to Inverter (if applicable)

Cable to Inverter is continuous and has correct polarity	

System Test Readings

Solar Array to Controller

Measured open circuit voltage of each string (add if more strings)		
String 1 V_{oc}	V	
String 2 V_{oc}	V	
Measured Short circuit current of each string		
String 1 I_{sc}	A	
String 2 I_{sc}	A	
Description of conditions- e.g. Sunny Day, early or late in day etc.		

Array open circuit voltage at controller (prior to connecting to controller or controller turned on)	V

Array short circuit current at controller (prior to connecting to controller or controller being turned on)	A
Array voltage at controller when system operating	V
Array current when system operating	A

Battery to Controller when the system is fully connected but no loads on.

Battery voltage of each string	
String 1	V
String 2	V
Battery Bank Voltage at Controller	V

Controller to Load Connection Point with no load

Voltage at load connection point	V

Name of Person Conducting Inspection and Test_____ _____ _

Signature_____

Date_____ _____ _____

38. DC Wiring Test and Inspection Certificate

Name of Customer_____

Location of House/business/public institution_____

Protection

How many circuits are there in the building or site?	
How many are light circuits?	
Are there any DC power outlet circuits?	
If so how many?	
The maximum demand current when all loads are on	A
The maximum demand current of the largest single load	A
The smallest size cable in the DC wiring	mm^2
The cable size to the largest single load	mm^2
The size of cable that is connected from the control board or controller to the DC load circuits	mm^2
The rating of the protection device protecting this cable	A
All cables in the system protected by this protection device?	

Voltage Drop

The size of the cable from controller to furthest load	mm^2
The length of this cable?	M
The maximum current on this cable?	A
The Voltage Drop (based on max current and nominal battery voltage) from the controller to the furthest load	V
	%
The size of the cable from controller to largest load	mm^2
The length of this cable?	M
The maximum current on this cable	A
The Voltage Drop (based on max current and nominal battery voltage) from the controller to the furthest load	V
	%

General Inspection

Cabling is mechanically supported	
There are no damaged cables	
There are no loops which could easily be pulled and damaged	

There are no exposed points where a short could occur	

Name of Person Conducting Test and Inspection_____ _____ _

Installer certificate institution issued and number_____

Signature_____

Date_____ _____ _____

39. AC Wiring Test and Inspection Certificate

Name of Customer

Location of House/business/public institution

Protection

How many AC circuits are there in the building or site?	
How many are light circuits?	
Is there a safety switch or residual current device (RCD) installed?	
The rating of the protection device protecting power circuits	A
The rating of the protection device protecting light circuits	A
Is there an earthing or grounding system installed?	

Tests Performed

Insulation Test	
Polarity Checked	

General Inspection

There are no exposed live parts	
All wiring is in accordance with AS/NZS3000 or the European standard.	

Name of Person Conducting Test and Inspection_____ _____ _

Electrical License- country issued and number_____ _____ ____

Electrical License expiry date:

Signature_____

Date_____ _____ _____