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Skul Blong Fotovoltak mo Riniuabol Eneji Enjiniaring

Sola Pawa Gaet

Buk ya oli raetem blong helpem evriwan I save hao blo usum sola or lo English hemi fotovoltek sistem.

UNSW Sydney NSW 2052 Australia
Woman we I raetem hemi Belinda Lam, Richard Corkish 2018
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Australia's
Global
University

School of Photovoltaic and Renewable Energy Engineering

Solar Power User Guide

Designed to educate village communities in Vanuatu about stand-alone Photovoltaic systems. A translation of this user guide is available in Bislama.

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**Solar Power User
Guide**

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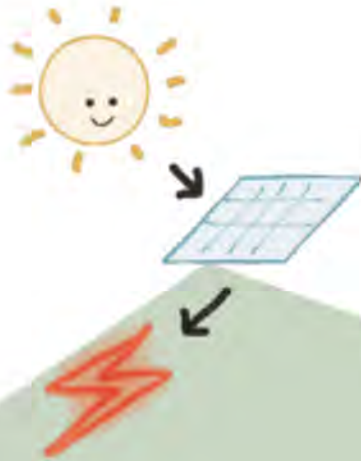
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Wanem ya Fotovoltek Sistem?

Wan fotovoltaic (FV) system hem I wan pawa sistem wei I tanem pawa long sun I go long elektrisity.

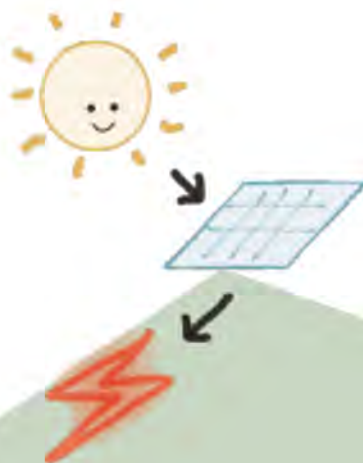


Wan full PV sistem hemi mas gat ol samting ya:

- Sola Panel
- Maonting Sistem
- Caboling mo Wiring
- Regulata
- Batri
- Inveta
- Lot (ol samting we oli usum or kakae power)

What Is a Photovoltaic System?

A photovoltaic (PV) system is a solar power system which converts energy from the sun into electricity.



A stand-alone PV system typically consists of:

- Solar Panels
- Mounting System
- Cabling & Wiring
- Regulator
- Battery
- Inverter
- Load

Ol Gudfala Saed Blong Usum FV Sistem

1. Sevem Mane

Sipos yu usum PV system bai yu save sevem mani blo yu, mo bi yu no westem mani blo yu lo kerosin or wan elektrisiti kampani.



2. Helpem Enviromen

Ol enegi wei I kamoat lo biomas, petrol, mo fossil fuil olsem col mo gas I save sakem sam ol rabis gas olsem Cabon Dioxide (CO_2) we I save mekem klaemet jenj o globol woming, mo spolem ples blong yumi.



3. Reliable Enegi

Sola enegi hem I wan pawa weh I no save finis from hem I karem pawa blong hem long San everi dei.

Benefits of PV Systems

1. Save Money

By using a PV system, you can save money you would otherwise spend on energy from diesel or an electricity company.



2. Help The Environment

Energy produced from biomass, petroleum and fossil fuels such as coal and gas create toxic emissions such as carbon dioxide (CO_2), which contribute to global warming.



3. Reliable Energy

Solar energy is an unlimited resource, as the sun will always rise and set everyday.

Sola Panels

Sola hemi kasem enegi long San mo jenisim I go long elektrisiti. Elektrisiti ya hemi jajem batri.



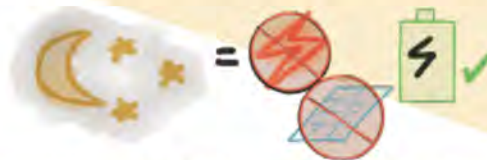
Long wan dei wei San I shaen gud hem I mekem fulap elektrisiti



Long wan dei we I ren or klaodi hem I mekem smol elektrisiti nomo



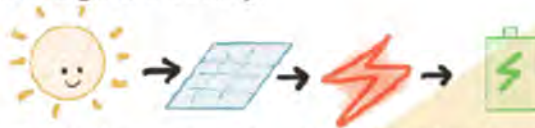
Lo naet I no gat San, so I no mekem Pawa. Pawa we I usum long naet I kam long batri.



Taem yu luk se I gat fulap klaod blong fulap dei I gud blo yu usum tumas pawa from batri blong yu bai no save ful jaj.

Solar Panels

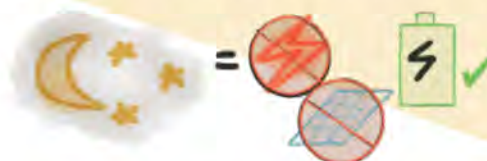
Solar panels absorb energy from the sunlight and convert it into electricity. This electricity is used to charge the battery.



On a sunny day more electricity is produced. On a cloudy day less electricity is produced.



At night there is no sunlight, so no electricity is produced. Energy used at night is from the battery.



If there are many cloudy days in a row, use less energy as the battery may not be fully charged.

Pem Gaet

Fulap sola panel weh yumi stap salem mo pem long Vanuatu oli no ol gudfala kualiti. Wan gudfala kualiti Sola Panel hem wan weh i mitim ol gudfala standed.

Wan gudfala stret Sola Panel hem i shud gat wan mak olsm long hem. Taem yu wantem pem wan Sola Panel oltaem yu mas lukluk gud sos i gat mak ya IEC 61215, IEC 61730 mo TUV mak long hem. Ol mak ya i soem se panel ya hem i wan gudfala Sola Panel.

Ol gudfala Panel i mas oltaem gat waranti blong olsem closap 20 yia. Ol rabis Panel i gat kasem tri yia nomo blong waranti.



Buying Guide

Many low quality solar panels are sold in Vanuatu. Good quality panels comply with standards.

There should be a label on the back of the solar panel. Look for IEC 61215 and IEC 61730 on the label.

Good quality panels should come with a manufacturer's guarantee (warranty) of at least 20 years. Low quality panels may only have 3 years.



Mentenens Blong Sola Panel

Klinim gud ol sola panel oltime wetem wota mo wan sopsop calico afta draem up wetem wan sopsop dry calico from sipos dust, toti or lif I stap long panel, bambae hem I blokem San mo bai sola I no save mekem plante pawa.



No mas usum wota we I kolkol tumas long hot sola panel from I save mekem Panel I krak mo bae demejem sola panel.

Yu mas katem doan ol tri weh I gro klosap lo Panel blong yu from shed blong wud by I blokem San mo mekem se I prodiusim smol elektrisity nomo.



Solar Panel Maintenance

If dust, dirt or leaves are on the panels, less electricity is produced due to shading because less sunlight is absorbed.



Clean your solar panels regularly with water and a soft cloth, then dry the panels with a soft dry cloth.



Do not use cold water on hot solar panels because this can cause them to crack and become damaged.

If trees or branches are shading the solar panels, less electricity is produced so you may need to cut them down.



Maonting Sistem

I gat fulap maonting sistem (hao blo stanemap sola blo I save kasem sun mo mekem pawa) blo Sola Panel olsem:

Ruf Maonting



Graon Moanting



Pole Maonting



Long Vanuatu, Sola Panel hem I mas lukluk long Not direksen long wan ankle blong 17° blong save kasem gud fulap San Laet, karem aot ol toti mo lif mo klinim gud Sola Panel taem I ren. Mo yu save putum panel blong yu long wan posisen blong $10^\circ \sim 27^\circ$ long wan Not Is – Not Wes direksen.



Sipos yu usum Maonting sistem yu mas mekem long ol strong materiel olsem aluminium mo stenles stil blong bae I save stap long time. Oli mas strong too blong save stanap long time blong wan hurican. Yu save usum MCs konekta mo dimaontabel pats we I save givim yu advans storej bifo wan hurican.

Mounting System

There are various mounting systems for solar panels such as:

roof-mount



ground-mount



pole-mount



In Vanuatu, solar panels should face North at a tilt angle of 17° to maximise exposure to direct sunlight, reduce the amount of dirt and leaves, and clean the solar panels if it rains. However, a tilt angle of $10^\circ \sim 27^\circ$ and facing North-East ~ North-West can also be used for the panels.



Mounting systems should be made of strong materials such as aluminium or stainless steel to last longer. They should be cyclone rated in case of extreme weather conditions. Using MC4 connectors and demountable modules will allow storage in advance of cyclone.

Caboling mo Wiring

Usum ol shot waea nomo, ol longfala waea hem big mani, bai save kakae pawa mo bae yumi kasem smol pawa nomo. Joinem mo fasem ol rop blong elektrik blong yu blong oli luk gud mo nit, be no mekem I taet tumas.



Ol tic waea oli sas, be oli save leftemap pawa mo helpem flo blong elektrisiti.

Yu mas mekem wan strong caboling we bai I save stap longfala taem mo I save stanap strong akensem ol hit mo hae tempereja.

Taem I gat wan broke coneksen by ol tuls or samting I no wok gud.



Cabling & Wiring

Use the minimum length of wiring required. Longer wiring is more expensive and will result in less energy output due to more resistance. Attach and support cables so they are neat and tidy but do not stretch them too tight.



Although thicker wiring is more expensive, it increases energy output by improving current flow.

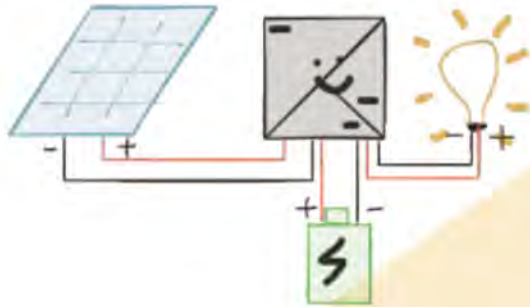
Durable cabling should be used which is resistant against sunlight and high temperature changes. Conduit protection can be used to protect from sunlight.

Make sure connections are joined properly, appliances may not work if there is a faulty connection in the wiring.



Reguleta

Wan reguleta or jaj controla hemi controlem pawa we I kam lo sola panel blo mekem se batri I no jaj tumas from taem batri I jaj tumas bae save nogud. Reguleta I stopem bigfala rilis mo I incrisim laef blong batri.



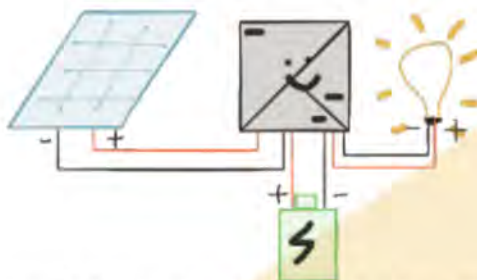
U no mas joinem equipment mo ol tul blong yu stret long batri. Taem yu konektem reguleta blong yu direk I go long wan samting olsem mobile fon or laet mo ol nara samting we oli usum pawa bai batri blo yu save continu blo jaj hemwan.

Wan reguleta I save damej taem I hot tumas, so yu mas instolem or putum long wan ples wei san I no strong tumas mo I gat smol win from bai I mekem reguleta blo yu I kolkol lelbet blo bae save wok gud.



Regulator

A regulator, or charge controller, is used to control the energy output from the solar panels to prevent the battery from being overcharged. The regulator also prevents excessive discharge and will increase the battery life.



Do not connect loads directly to the battery. Connecting the regulator directly to the load allows the battery to continue being recharged.

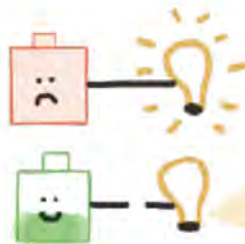
The regulator can be damaged if overheated, so install it out of direct sunlight with good airflow.



Batri



Elektricity weh I kam long Sola panel hem I jajem batri.

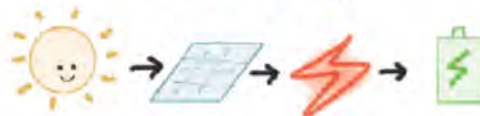


Sipos Batri blong yu hem I empti, karem aot Lot o ol samting osem mobael fon we I save kakae pawa blong sola I save jaj gud bagegen.

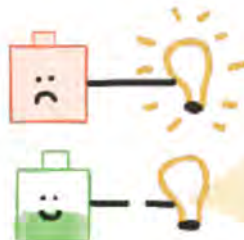


Putum gud batri long wan contena we I gat lit blong blokem ol samting I no kasem from hem I denja tumas taem I broke. I gat poesen lo batri so yu meksua se batri I no mas brok. No mas mekem ol pikinini I tajem batri.

Battery



The electricity generated by the solar panels is used to recharge the battery.



If the battery becomes empty, disconnect the load to allow it to recharge.

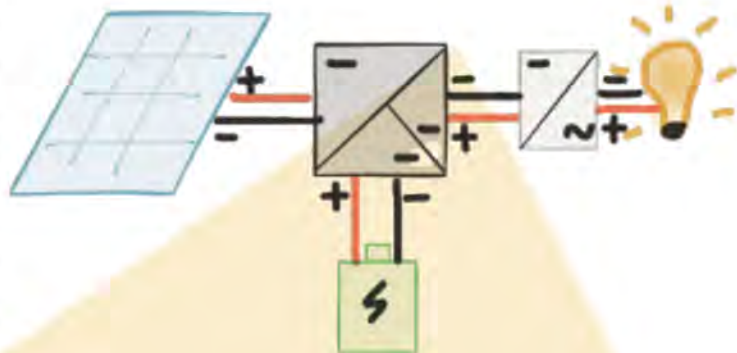


Batteries are dangerous, store them in a safe enclosure with a lid to prevent objects accidentally hitting them. Do not allow children to touch batteries.

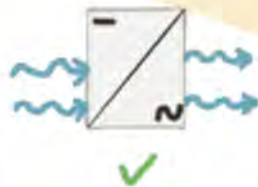
Inveta

Wan inveta hem I jenisim direct curen (DC) [-] weh I kam long Sola Panel I go long on nara curen (AC) [~] blong yu save usum blong ol Lot or appliances blong yu.

Yu no nidim inveta sipos ol lot or appliances blong yu hem I ol DC lot.



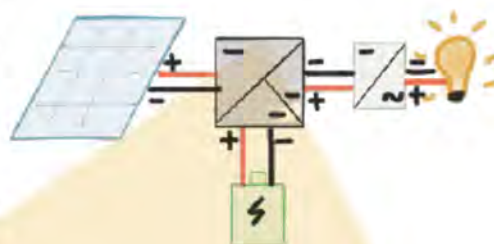
Wan inveta I save damej sipos I gat tumas hit, mekem sua se yu instolem or putum long wan ples we I no stap long San mo we gud-fala wind I save pass.



Inverter

An inverter converts the direct current (DC) [-] input from the solar panels to alternating current (AC) [~] output for the load.

An inverter is not required if there are only DC loads, such as LED lights and phone charging.



The inverter can be damaged if overheated, so install it out of direct sunlight with good airflow.



Lot

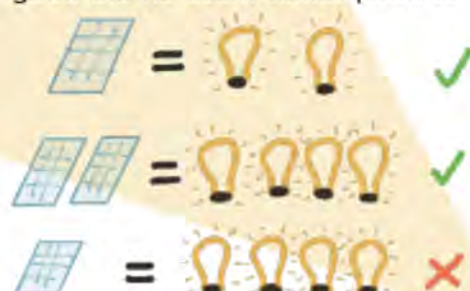
Lot hemi I ol appliances olsem lite mo taem yu jajem fon wei u usum pawa long Sola panel or batri. Lot I save DC or AC (Yu no nidim inveta sipos ol lot or appliances blong yu hem I ol DC lot).



Hemi gud blong usum ol appliances long day taem sun I strong gud mo batri hem I jaj gud, so yu meksua blo jajem fon lo de-laet, mo usum ol nara samting we oli kakae pawa.

Lo naet bai gat smol pawa nomo from I nogat san so I good blo no usum tumas pawa lo naet.

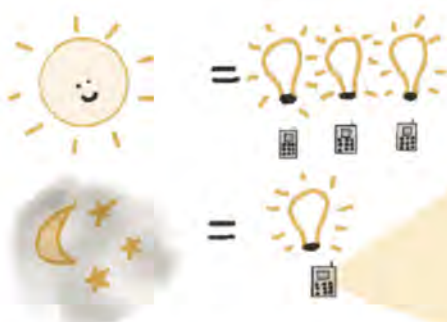
Yu no mas usum plante samting tumas we oli kakae pawa lo semak taem from bai electric I save spolem sam lo olgeta mo bai yu save spolem sola blo yu too.



Load

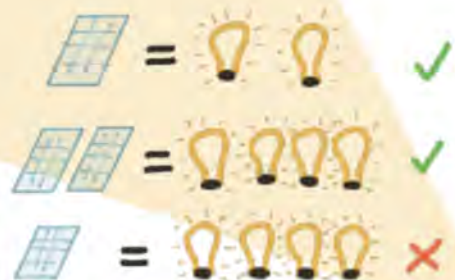
The load, including appliances such as lighting and phone charging, is powered by the solar panels or battery.

Loads can be DC or AC (inverter not required if there are only DC loads).

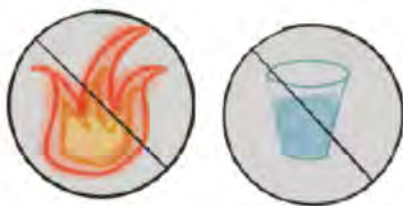


It is best to use appliances during the day when it is sunny and the battery is recharged.

Do not overload the system by connecting too many appliances. This will prevent them from working properly and short circuit the system.



Sefti



No putum faea mo wota klosap lo sola system blo yu.

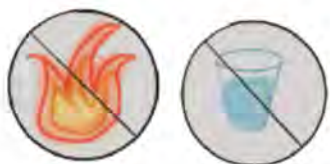
Yu mas kipim sistem long yu long wan ples weh win save pas long hem yu no mas kavremap.

No mas mekem ol pikinini I tajem batri.

Putum sistem blong yu long wan ples wea by I no gat samting I foldaon long hem. Wan gud-fala exampol blong usum hem I wan Wuden Bokis.



Safety



Keep fire and water away from the system.

Keep the system and battery well ventilated, do not cover it.

Do not allow children to touch the batteries.

Install the system in a location where objects cannot fall on top of the components, for example a ventilated wooden box.



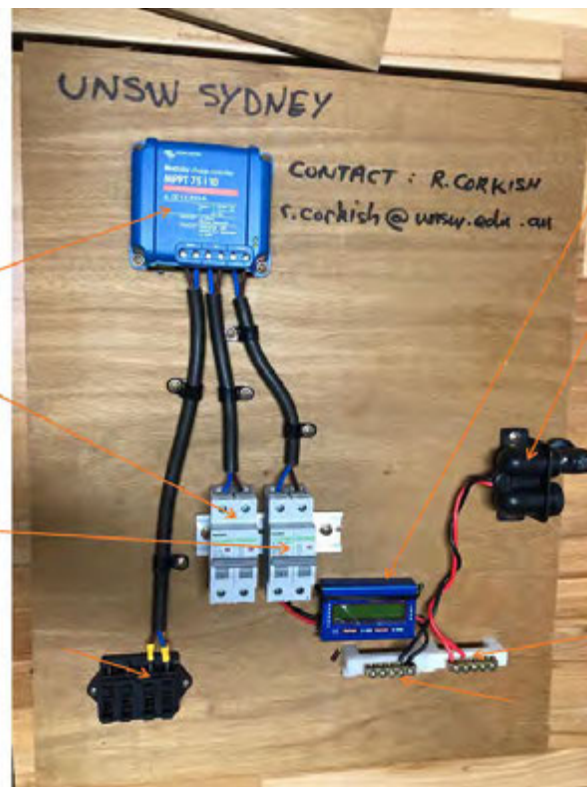
Example: Destribusen bod we oli mekem blong aidpost raon long Tanna, i soem stret fasin blong setemap sola sistem blong yu.

Jaj kontrola (rekuleta)

Dabol Dc sekut breka blong pawa ikam long sola panel

Dabol dc sekut breka blong pawa iko lo ol laet wetem ples oli jajem fon

Fues holda blong ol fues we pawa i stap ko mo kamaot long batri



Meta blong makem o mesarem pawa iko long ol laet mo fon jaga

12v Dc soket blong jajem fon(fon jaga)

U.S.B plak blong jajem fon long trak

link o lain blong konektem (+) waia iko long ol laet

Link o lain blong konektem(-) waia iko long ol laet

Example: This distribution board, made for a Tanna Aid Post, shows good practice.

Charge controller

Double DC circuit breaker for the power coming from the solar panels

Double DC circuit breaker for the power going to the lights and the phone chargers

Fuse holder for fuses for the power going to or coming from the battery



Meter to measure power going to the lights and the phone chargers (optional)

12V DC sockets for phone charging

USB car socket for phone charging

Link for connecting (+) wires to the lights

Link for connecting (-) wires to the lights



Olsem memori blong jif jacob kapere

In memory of Chief Jacob Kapere



Photo credit: Nicholas Lee 2017

