



جابتن تناك

DEPARTMENT OF ENERGY
PRIME MINISTER'S OFFICE | BRUNEI DARUSSALAM

GUIDEBOOK

SOLAR PV ROOFTOP and Net-metering Programme

@ Department of Energy at the Prime Minister's Office 2025

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by Energy Transition Division,

Department of Energy at the Prime Minister's Office.

The Guidebook for Solar PV Rooftop and Net-metering Programme serves as a reference for parties who wish to explore the opportunity to produce solar energy. The Guidebook contains general information on planning for a solar PV system and how to enroll in the Net-metering Programme. This information is intended to be used alongside the Code of Practice for Small-Scale Solar Photovoltaic System Connection to Low Voltage Network.

The Guidebook is subject to periodical review to keep abreast with the development of technologies, standards and best practices.

Any suggestion or recommendations can be emailed to Energy Transition Division at renewable.energy@energy.gov.bn

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INTRODUCTION ON SOLAR PV SYSTEM



"BPC Headquarter Building rooftop solar PV system with capacity of 191kWp"

Photo credit: Berakas Power Company Sdn. Bhd

What is Solar Photovoltaic (PV) System?

A technology that produces electricity by converting energy from the sun, that can be used to power your home. Photovoltaics, and often shortened as PV, gets the name from the process of converting light (photons) to electricity (voltage), which is called the photovoltaic effect.

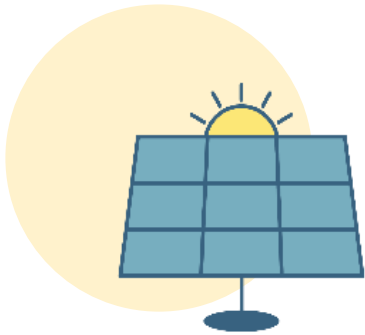
Photovoltaics also widely known as **solar panels**.

Today, electricity generated by this photovoltaic system has become cost competitive in many regions and these systems are being deployed at large scales to help power the grid.



"Solar panels installed at the rooftop of Temburong District Office at Temburong District"

HOW DOES A SOLAR PV SYSTEM WORK?



Solar panels

1/ Solar panels convert energy from the sun to electricity.



Inverter

2/ An inverter converts the electricity produced by solar panels from direct current (DC) to alternating current (AC) for use in your home.



Meter



Household appliances

3/ The converted electricity then powers your household appliances.



Grid

4/ Depending on the type of meter used (a bi-directional meter type for this illustration), excess converted electricity after own consumption will be registered and exported to the grid.

5/ The grid acts as storage for the registered and exported excess converted electricity. At night when solar panels are not producing, you will be able to import back the exported electricity to power your household appliances.

WHAT IS SOLAR PV ROOFTOP SYSTEM?

It is a Solar PV system that is mounted on the roof or integrated into the façade of the building. The solar output potential for an individual rooftop depends on the number of factors which includes the number and size of solar panels, shading, tilt and overall constructability of integrating the solar system with the roofing structure.



Most common solar rooftop photovoltaic system types in Brunei are mounted on the roofing of a building, or mounted at the garage or car porch.

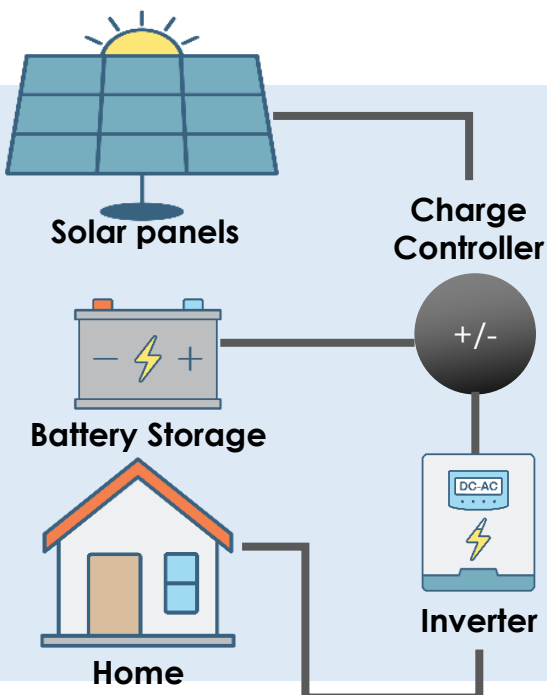
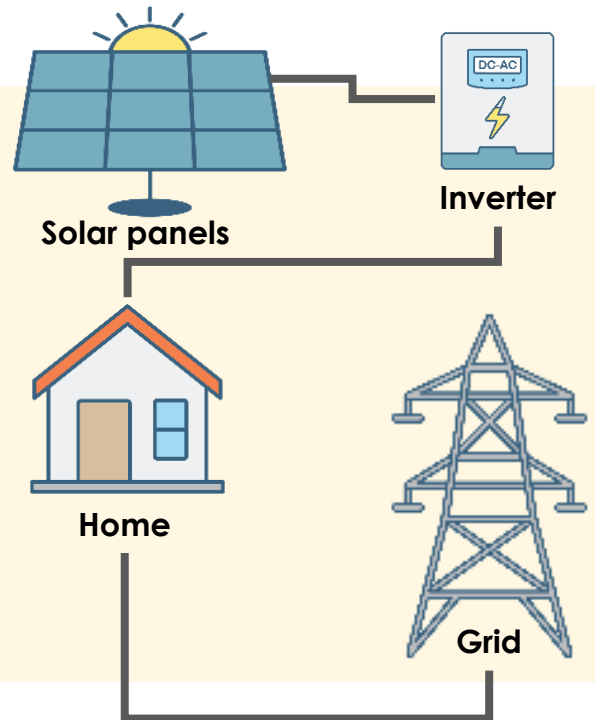


CLASSIFICATION OF SOLAR PV SYSTEMS

Solar PV systems can be broadly classified in two main types:

1/ GRID-TIED SYSTEM:

The system is directly coupled to the grid. Electricity generated by the system could either be sold or bought from the Utility. There are many benefits of having this system installed; less balance of system components are needed, eliminates energy storage (battery) requirement therefore simultaneously reduce cost of system, utilize the existing electrical infrastructure and efficient use of available electricity (contributes to grid if there are excess electricity available).



2/ OFF-GRID OR STANDALONE SYSTEM:

The system is independent and not connected to the grid. The system could be complex, and could be as simple depending on the size of load it will serve. It is also possible to connect the solar panels directly to a DC load when storage methods are used.

Hybrid system is also possible where battery storage system combined with grid connection for additional reliability and scheduling flexibility.

HOW DO I START PLANNING FOR MY SOLAR PV SYSTEM?





START

I would like to
reduce my monthly
bill

My home or building
is connected to the
grid

My home or building
is not connected to
the grid

Off-grid or Standalone Solar PV System



Go for the **off-grid or standalone system**.
This is suitable if you wish to power home
or building that has no existing electricity
infrastructure yet e.g. houses located at
rural areas, agriculture, etc.

In this set-up, there is usually a need to
have battery storage system installed
together with the Solar PV to increase
reliability of electricity supply.

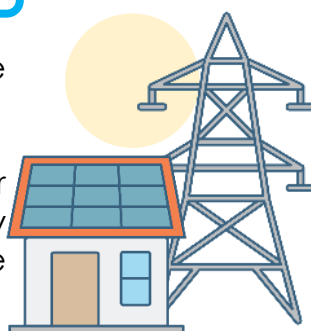


Grid-tied Solar PV System



Go for a **Grid-Tied Solar PV** as you are
already connected to the network.

Any electricity generated from the Solar
PV system will reduce your next monthly
bills since you are reducing your reliance
to the grid electricity supply.



HOW TO SIZE MY SOLAR PV SYSTEM BASED ON MY NEEDS?

Before you decide on the capacity of your Solar PV system, it is best to size your system correctly. Under-sizing or oversizing your system will produce undesirable outcome as you may not be able to enjoy the full benefits of having the solar PV system installed due to incorrect sizing.



STEP 1

Check your consumption

Refer back to your bills and check your monthly consumption.

STEP 2

Create different scenarios of size of system

The purpose of creating different scenarios of size of the Solar PV system is to make comparison to your monthly consumption.

To calculate how much electricity each kilowatt-peak (kWp) a solar system can generate:

$$\text{"A" kWp system} \times 24 \text{ hours} \times 30 \text{ days} \times \text{capacity factor of panel} = \text{Kilowatt-hour (kWh) generated}$$

Where "A" kWp system = size of solar PV system

Capacity factor of panel = This is a measure of how much energy is produced by a plant compared with its maximum output. A useful starting assumption is 0.18 or 18%

Worked example:

- My monthly consumption is 1000kWh or 1000 units,
- Should I install a 1kWp system, 3kWp system, 5kWp system or 10kWp system?
- Which size will be able to cover my monthly consumption?

$$1 \text{ kWp system} \times 24 \text{ hours} \times 30 \text{ days} \times 18\% = 129.6 \text{ kWh generated}$$

1 kWp system = 1kWp

Capacity factor of panel = 0.18 (or 18%)

1kWp system can generate 129.6 kWh. This means that a 1kWp system can only cover about 13% of your monthly consumption.

STEP 3

Try calculating for different kWp system to size correctly:

	kWh or unit generated
3kWp	388.8
5kWp	648.0
10kWp	1296.0

From the calculation, check which one option is equal to or close to your monthly consumption of 1000 kWh or 1000 units. Based on the above, Solar PV system with 8kWp to 9kWp capacity can cover your 1000kWh or 1000 units monthly consumption.

STEP 4

Check the cost of Solar PV system

Once you have decided on your capacity or size of installation, you should check the cost of the overall system including the material procurement cost, installation cost and operating cost (if any).

STEP 5

Check your Payback Period

It is equally important to check your Payback Period before making investment for the system. Payback Period means the length of time required for your investment to recover its initial outlay in terms of savings.

How to calculate your Payback Period?

$$\text{Payback Period} = \text{Total Investment Cost} / \text{Total savings per year}$$

For example:

If you have monthly consumption of 1000 kWh or 1000 units, and you decided to install a 7kWp system then the savings is equivalent to solar generation of about 907.2 kWh.

END

STEP 6

Convert your savings to monetary value

If you are categorized under Residential Tariff, you will be calculating based on the prevailing tariff (See [link](#) for tariffs). For instance, to convert 907.2 kWh or 907.2 units to monetary value under Residential Tariff in Brunei is:

		For 907.2 kWh or 907.2 units	Bills (B\$)
First 600 units or 600 kWh	B\$0.01 per kWh or B\$0.01 per unit	600	B\$6.00
From 601 to 2000 kWh or units	B\$0.08 per kWh or B\$0.08 per unit	307.2	B\$24.58
First 2001 to 4000 kWh or units	B\$0.10 per kWh or B\$0.10 per unit	-	-
Beyond 4001 kWh	B\$0.12 per kWh or B\$0.12 per unit	-	-
Total			B\$30.58

Your savings is about B\$30.58 per month.

To calculate your Payback Period:

$$\text{Payback Period} = \text{Total investment Cost}^* / (\text{B\$30.58} \times 12 \text{ months})$$

$$= \text{approximately 8 years}$$

**Assuming total investment cost of B\$3,000.00, then the payback period is 8 years.*



NET-METERING PROGRAMME

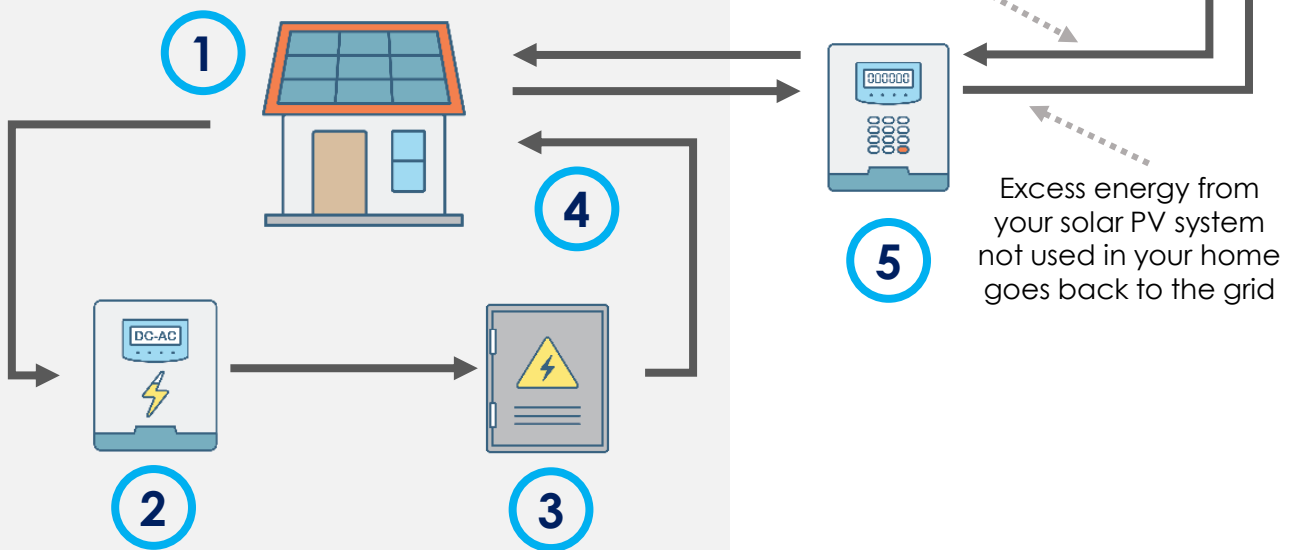
"Main Switch Board (MSB) at Public Works Department Headquarters"

Photo credit: Department of Energy

What is Net-metering?

Net-Metering is mechanism that allows solar photovoltaic (PV) system owners to export their excess energy generated by their Solar PV system back to the grid in exchange for credit.

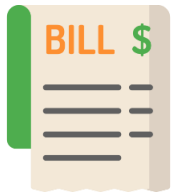
How does Net-metering work?



- 1/ Solar panels convert energy from the sun to electricity.
- 2/ An inverter converts the electricity produced by solar panels from direct current (DC) to alternating current (AC) for use in your home.
- 3/ The electricity converted goes to your distribution board.
- 4/ The electricity is used in your home.
- 5/ The Net-meter measures energy used from the grid and excess energy produced from your home.

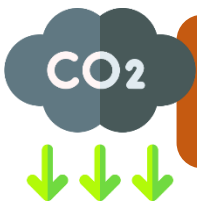
WHAT ARE THE BENEFITS?

Why should I invest in
Net-metering?
What do I gain from it?



REDUCE Bills

**INCREASE
Savings**



**REDUCE
Carbon
Footprint**

**Consume LESS
Fossil Fuel**



Net-metering enables you to take control of your energy needs by installing and generating your own electricity and therefore, reducing your future monthly electric bills and increase your savings. The battery-less storage system is an environmental-friendly solution that will help you reduce your carbon footprint and lessen the use of non-renewable energy.

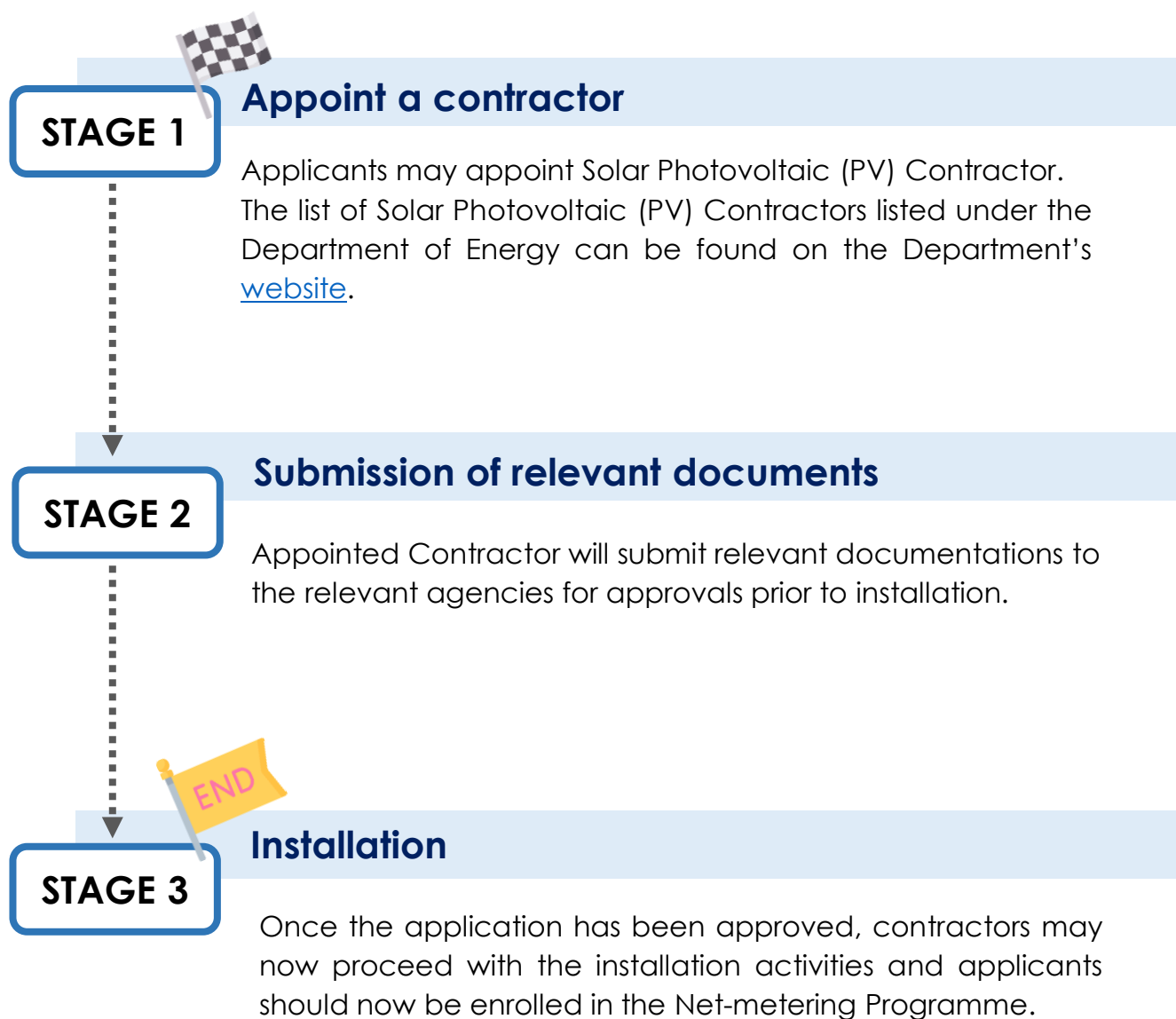


"18kW Solar Net-metering at Kg Subok's residence"

Photo credit: MegaWatt Solar Solution Sdn. Bhd

HOW DO I APPLY FOR NET-METERING PROGRAMME?

Applicants who are interested in enrolling in the Net-metering Programme are to follow each stage:



ESTIMATED COST BREAKDOWN OF THE SYSTEM

In high level, Solar PV system consists of these main elements. Which in rule of thumb, the cost of these elements can be ratio as below.

Main Elements of Solar PV System	Cost Ratio	Price (example for 1kWp system)
Solar panel	25%	~B\$970
Battery (for off-grid system)	25%	~B\$970
Installation	20%	~B\$780 – B\$850
Mounting system	30%	~B\$370
Inverter		~B\$810

This is to be used **as a reference only and will depend on your specific needs**. Applicants are encouraged to conduct their own market survey.

Net-metering Programme

	Price
Net-meter	B\$1100 – B\$2100*
Net-metering Application Fee	B\$5/kW
Installation of Net-meter	~B\$150

*Disclaimer: Prices stated are based on 1kWp.

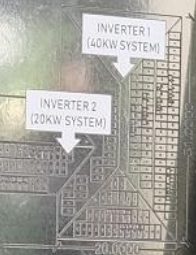
Other Services

	Price
Structural assessment of rooftop of building for Net-metering Programme	B\$300**
Electrical Design of Solar PV system for Net-metering Programme	B\$300**
Testing and Commissioning of Solar PV System	B\$200**

**Disclaimer: Prices stated are based on minimum capacity installation.



KAPASITI 100KW PEJABAT
TOPSOLAR PHOTOVOLTAIC



Peringkat di Bangunan Kersajaan
Government Building

27th Mei 2021

27th May 2021

Kementerian Tenaga dan Jabatan
Perkhidmatan Elektrik

Ministry of Energy and Department of
Electrical Services

Pejabat Daerah Temburong
Temburong District Office

255 panel

255 panels

3 inverter

3 inverters

3 Net meter

3 Net meters

100kWp

112,820 kWh

1,332 kWh

1,332 kWh

1,332 kWh

1,332 kWh

1,332 kWh

1,332 kWh

1,332 kWh

1,332 kWh

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SUCCESS STORIES OF NET-METERING

*"The Launching of the First Solar-Powered Government Building by
Yang Berhormat Dato Seri Setia Dr. Awang Haji Mat Suny Bin Haji Md
Hussein"*

Photo credit: Department of Energy



"100kW Solar PV System installed on the rooftop of Temburong District Office"

The Department of Energy at the Prime Minister's Office of Brunei Darussalam conducted a pilot project on Net-metering in 2020. Four residential houses and two government buildings participated in the pilot project.

Below shows the outcome of the pilot project.

Government Building

One of government buildings enrolled under the Net-metering Programme is Temburong District Office, at Pekan Bangar, Temburong. A total of 100kWp Solar PV system was installed in the year 2021, and the system was officiated by the Minister of Energy in July 2021.

After 3 months of being enrolled in the Net-metering Programme, the building had shown a reduction of about B\$1,000.00 per month from the installation of the 100kWp system at the rooftop.

FUN FACT: 100kWp system at Temburong District Office is **the first and the largest solar rooftop** installed at Government building in Brunei.

SUCCESS STORIES OF NET-METERING

Residential Houses

Three of the pilot houses have a significant reduction of monthly bills after enrolling to the Net-metering Programme. Figure below shows the graphical illustration of the three pilot houses before and after enrolling in the programme.

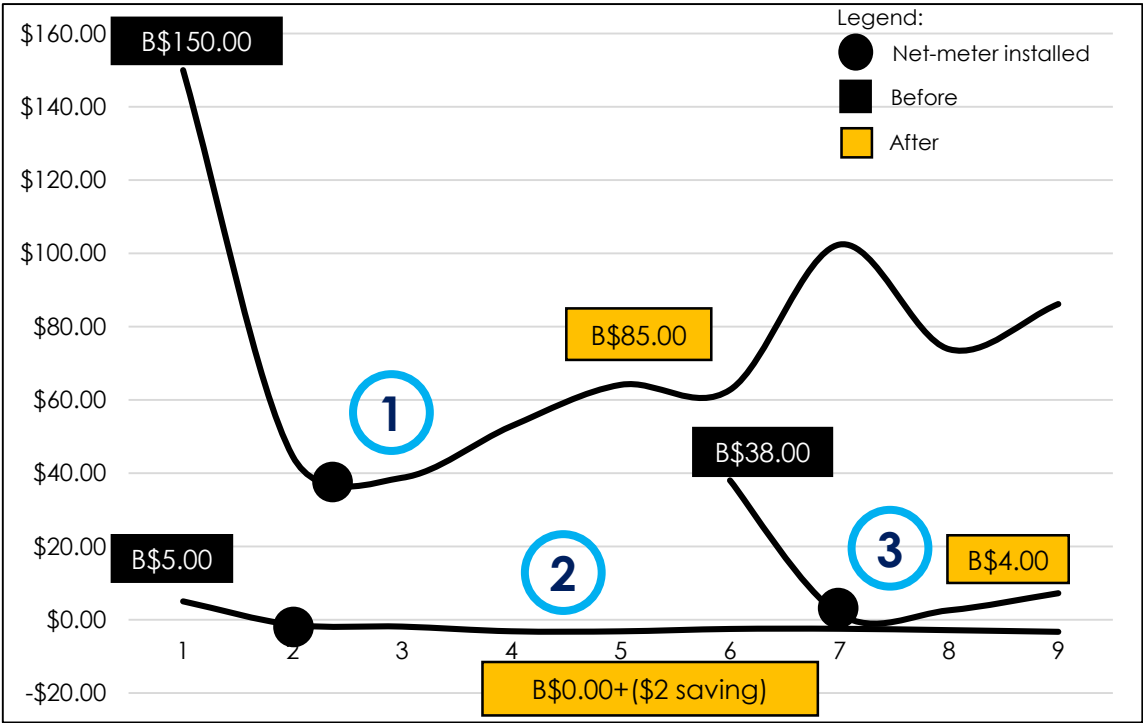


Figure: Graphical illustration of monthly billing of pilot houses before and after enrolment in Net-metering Programme

		percentage reduction
1	Pilot House 1 (20kW)	60%
2	Pilot House 2 (3kW)	150%
3	Pilot House 3 (5kW)	90%

TERMS AND DEFINITIONS

Alternating Current (AC):

Flow of electric charge that can reverse periodically. The type of current used at your home and in the grid.

Direct Current (DC):

Electric charge that flows in one direction.

Export:

It is the excess electricity produced by Solar PV Rooftop System that gets exported to the grid.

Grid:

Also known as Power Grid, is an interconnected electric power distribution system that delivers electricity from producers to consumers.

Inverter:

It is an electric device that converts Direct Current (DC), which is the output of the solar panels into Alternating Current (AC), which is the type of current used by the grid, homes and buildings.

Kilowatt:

Rate at which energy is being generated or consumed.

Kilowatt-peak (kWp):

Rate at which solar panels generate energy at peak performance.

Net-Meter:

It is an energy meter that can run both forward and backward, measuring both energy imports and exports.

Non-Renewable Energy:

Energy derived from natural sources that cannot be replenished, such as Fossil Fuel, Coal & etc.

Solar Photovoltaic (Solar PV):

A solar system that directly converts sunlight into electricity.

REGISTRATION FORM FOR SOLAR PV CONTRACTOR

Solar PV Supplier / Manufacturer / Installer participating for Net-metering Programme should be listed under the Department of Energy by submitting the form via email to renewable.energy@energy.gov.bn. The form can be downloaded from the Department of Energy website.



ENERGY TRANSITION DIVISION
DEPARTMENT OF ENERGY AT PRIME MINISTER'S OFFICE

REGISTRATION FORM (SOLAR PV SUPPLIER / CONTRACTOR / INSTALLER)
Please complete this form and send to renewable.energy@energy.gov.bn

Register as

(Solar PV Supplier/Contractor/Installer)

Company Owner's Name

Company Name

Company Registration Number

Expiry Date

Company Address

Email

Website

Contact No.

Recent Projects

(List recent solar installation projects done by Company, including year of installation, type of projects, etc.)

USEFUL LINKS

Net Metering Application Form

Click [here](#)

Solar PV contractor Registration

Click [here](#)

Code of Practice for Small-Scale Solar Photovoltaic System Connection to Low Voltage Network

Click [here](#)

[End of document]

