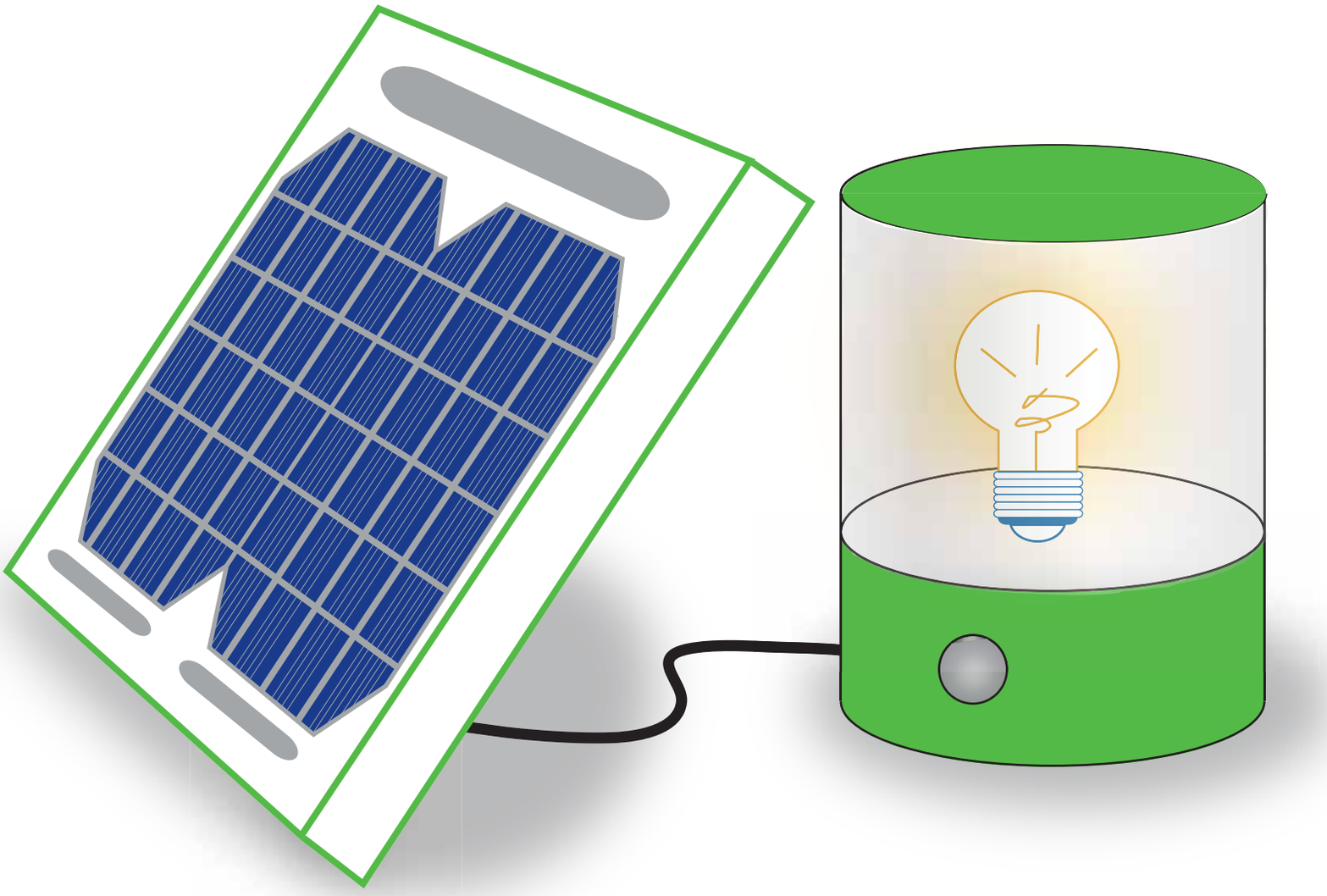
SOLAR PHOTOVOLTAIC SYSTEMS REBATE INITATIVE(SPRI) INFORMATION PACK

GOVERNMENT OF BERMUDA
Ministry of Economic Development
Department of Enegry



SOLAR PHOTOVOLTAIC SYSTEMS convert sunlight directly into electricity, which can be used within your home or fed back into the electrical grid.

This guide contains important information that may be useful if you are considering buying a solar photovoltaic system for your home or small business.

GENERAL INFORMATION

WHAT IS A PHOTOVOLTAIC SYSTEM?

A photovoltaic system consists of one or more solar photovoltaic panels, a mounting frame, some wiring and an inverter. The photovoltaic panels contain a special material that converts sunlight directly into electricity. The inverter conditions this electricity to ensure it is compatible with appliances in your home and can be safely fed into the electricity grid.

IS THE TECHNOLOGY ALREADY USED IN BERMUDA?

There are dozens of homes in Bermuda already using solar photovoltaic technology, visit **www.energy.gov.bm** to view some of them.

DOES ENERGY EFFICIENCY MATTER IF I PLAN TO GET A PHOTOVOLTAIC SYSTEM?

Absolutely. If you use less energy, you will need less energy to be generated by your solar photovoltaic system. This means you will need fewer solar panels, which will occupy less space and cost less. Replacing inefficient appliances with efficient ones is nearly always more cost-effective than using solar photovoltaic technology. Spending a few thousand dollars on highly efficient appliances could reduce your energy consumption enough to save tens of thousands of dollars you would otherwise need to spend on solar panels! It is particularly important to use energy efficient air conditioning, space heating, ventilation, water heating, lighting and refrigeration systems. More information on energy efficient appliances and other ways to conserve energy is available from the energy efficiency page of **www.energy.gov.bm**.

HOW LONG WILL A SYSTEM LAST?

Most good-quality solar photovoltaic panels will last over 25 years and have frequently been known to last up to 40 years! Inverters must typically be replaced every 5-10 years and this should be accounted for when assessing the cost of a system.

I AM A LANDLORD, WHY SHOULD I GET A SOLAR PHOTOVOLTAIC SYSTEM FOR A PROPERTY I RENT OUT?

Investing in a solar photovoltaic system can provide a regular monthly return for decades. Why not fit a system to a property you own and develop a new lease that includes payments from your tenants to cover the value of electricity you are producing on their behalf? A solar photovoltaic system may also make your property more attractive to potential tenants who would rather use 'clean' energy.

WHAT SIZE SYSTEM DO I NEED TO PROVIDE ENOUGH ELECTRICITY FOR MY HOME?

Photovoltaic systems are usually sized electrically in terms of 'kilowatts' of installed capacity. A 2-3 person home in Bermuda typically requires between 3 and 5 kilowatts of installed capacity to meet its annual electrical energy requirements, though this will vary depending how much electricity you use. The actual physical size of the system will depend on both the installed capacity and the module efficiency; the table below shows the typical area required for common system efficiencies and sizes:

Module Type	Typical Module Efficiency	Area Required for 3 Kilowatt System	Area Required for 5 Kilowatt System
Monocrystalline Silicon	18-20%	170 sq ft	290 sq ft
Polycrystalline Silicon/other	14-16%	210 sq ft	350 sq ft

SYSTEM LOCATION

WHERE SHOULD THE SOLAR PANELS BE LOCATED?

For maximum energy yield, panels should be located in an un-shaded location which faces South at an angle close to 32 degrees from horizontal. You are encouraged to maintain the design and look of your property when considering where and how to install any panels. An experienced/reputable solar installer should be able to advise how best to integrate a system into the space available on your property.

WILL THE DEPARTMENT OF PLANNING ALLOW SOLAR PHOTOVOLTAIC PANELS?

The Bermuda Plan 2008 Planning Statement encourages the development of renewable energy sources and permits their installation in any zone at the discretion of the Development Applications Board, or through a Permitted Development Permit where applicable. To date, the majority of applications for solar photovoltaic arrays have been approved by the Department of Planning.

Most solar photovoltaic systems require submission of a DAP1 planning application, but if your system is under 400 square feet it may be eligible for a Permitted Development Permit instead; these can usually be obtained within a few weeks. More specific information is available in guidance notes GN101 (General Development Order) and GN102 (Permitted Development Permits) from the Department of Planning, **www.planning.gov.bm.**

Delays may be experienced if the application is incomplete or does not include all the relevant information, so please visit **www.planning.gov.bm** to view the Department's Guidance Note on Renewable Energy, GN112. For more information contact the Department of Planning directly at **(441) 297-7756**.

WILL SOLAR PANELS AFFECT THE ABILITY OF MY ROOF TO CATCH WATER?

Solar photovoltaic panels should be installed carefully to avoid channeling water away from gutters. Although solar photovoltaic panels are generally constructed from benign materials such as aluminium and glass, you should discuss any concerns about the impact of a solar photovoltaic system on your drinking water quality with an experienced/reputable solar installer. If you need to paint your roof once the solar panels have been installed, it should be possible to reach under the mounting frame of many smaller systems with a specially adapted roller. Alternatively, it may be possible to remove panels to gain access, though this may increase the cost of painting your roof. Experience in Bermuda to date has shown the roof surface under solar panels typically remains in good condition as it is protected from weathering due to rain and damaging solar radiation.

FINANCIAL INFORMATION

HOW MUCH DOES A SOLAR PHOTOVOLTAIC SYSTEM COST?

A system is estimated to cost around $5,000-$7,000 per kilowatt of installed capacity, so expect to pay between $15,000-$21,000 for a 3 kilowatt system. It is sensible to obtain several quotations from different installers to get a competitive price.

HOW MUCH DOES THE FUEL COST FOR A SOLAR PHOTOVOLTAIC SYSTEM?

Nothing. Ever.

SYSTEM INSTALLATION INFORMATION

HOW LONG WILL IT TAKE FOR THE SYSTEM TO PAY FOR ITSELF?

The length of time it will take for a solar photovoltaic system to pay for itself depends on the initial cost of the system and the cost of electricity over the lifetime of the system. Expect a reasonably priced system to pay for itself in around 10 - 15 years, though this will reduce as the price of fossil fuels increases. Your installer should be able to assist you with estimating how long it will take for your system to pay for itself.

WHAT IS THE GOVERNMENT DOING TO REDUCE THE COST OF SOLAR PHOTOVOLTAIC SYSTEMS?

There is no import duty on complete solar photovoltaic systems and many spare parts. The Government also offers a rebate of up to **$5,000** if your system is installed by experienced/reputable installer. More information is available from **www.energy.gov.bm**.

IS FINANCING AVAILABLE FOR SOLAR PHOTOVOLTAIC SYSTEMS?

Certain local banks have agreed to add the cost of installing a solar photovoltaic array to existing mortgages, while others will be providing loans specifically for this technology, so you may be able to swap your existing electric bills for loan repayments on a solar photovoltaic system. Once the loan has been repaid, you get free energy!

HOW MUCH WILL I BE PAID FOR ANY EXTRA ELECTRICITY PRODUCED?

BELCO currently offers a 'net metering' rate for any electricity fed into the electrical grid from small scale renewable energy systems. A net metering rate means the rate paid to you for any energy you feed into the electric grid will be exactly the same rate you pay for energy you buy from BELCO, including the fuel adjustment surcharge. If you pay $0.34 per kilowatt hour you consume, you will be paid $0.34 per kWh you feed back. A 3 kilowatt system should generate just over $130 worth of electricity a month at current rates ($0.34 per kilowatt hour).

HOW LONG WILL THIS RATE BE OFFERED?

The 'net-metering' rate is subject to change in the future, but any changes must be approved by the Energy Commission, and the Government is committed to ensuring a fair rate is paid to those producing electricity from renewable energy resources.

I CAN'T AFFORD A SOLAR PHOTOVOLTAIC SYSTEM, WHAT ELSE CAN I DO?!

There is no need to have a system that provides exactly the same amount of electricity as you consume, so if cost is an issue, why not consider a smaller system that just reduces your bill instead of eliminating it? If you really can't afford solar photovoltaic technology, think about replacing your major appliances with the most efficient models available.

WHAT LOCAL COMPANIES INSTALL SOLAR PHOTOVOLTAIC PANELS?

There are several local companies who have the relevant experience and a manufacturers's endorsement to design and install solar photovoltaic systems. They can be found in the local telephone directory or by doing some research on-line for them.

CAN I INSTALL MY OWN SYSTEM?

Although solar photovoltaic systems are relatively simple and can be installed with some basic knowledge and training, it is very important they are properly designed and installed if they are to perform in a safe and efficient manner. Due to the cost of the system and the potential safety hazards of improperly installed systems, the Department of Energy recommends you use an experienced/reputable installer who has the necessary knowledge and experience to ensure your system is properly designed and installed. An experienced/ reputable installer should also be able to ensure your system meets BELCO's qualifying criteria so you can interconnect with their electrical grid.

HOW DO I KNOW IF A SYSTEM IS GOOD QUALITY?

Solar photovoltaic panels should be UL 1703 listed and inverters should comply with IEEE 1547 and UL 1741 so make sure you ask your installer for equipment that meets these standards. These standards are also listed in BELCO's qualifying criteria and must be adhered to if you wish to interconnect with their electrical grid. Installers should also hold an appropriate certification, which demonstrates they have the knowledge to properly design and install photovoltaic systems.

SHOULD I LOOK FOR A WARRANTY ON A SYSTEM?

Manufacturers of solar photovoltaic panels typically provide a power output warranty of at least 25 years, split into two parts: panels are usually warranted to produce no less than 90% of their rated power for the first 10 years of operation and no less than 80% for a further 15 years of operation. The manufacturer should also provide a 5 year warranty on materials and workmanship of their solar panels. Installation warranties vary from company to company, so make sure you ask around and choose carefully.

WILL SOLAR PANELS SURVIVE A HURRICANE?

Much like a roof, the survivability of a solar photovoltaic system depends on how well it has been designed, built and also upon the particular conditions experienced during a hurricane. If your system is properly designed and installed on a strong roof using high-quality products it should withstand hurricane force winds. It is best to discuss any concerns directly with your solar installer, though you may also wish to consider insuring your system. Remember that damage could occur from flying debris such as loose tree branches, so if a hurricane is approaching, make sure you trim any trees and secure any loose objects near the solar array.

BATTERIES, THE ELECTRIC GRID AND BELCO

DO I NEED BATTERIES TO STORE THE ELECTRICITY PRODUCED BY A SOLAR PHOTOVOLTAIC ARRAY?

Battery systems increase the cost of a solar photovoltaic system substantially and if you are connected to the electrical grid, there is probably no need to have any. By entering into an interconnection agreement with BELCO, they will act as your back-up by providing electricity when you need it and accepting excess electricity generated by your system back into the grid, for which you will be credited.

CAN SOLAR PANELS PROVIDE ELECTRICITY WHEN THERE IS AN ELECTRICITY OUTAGE?

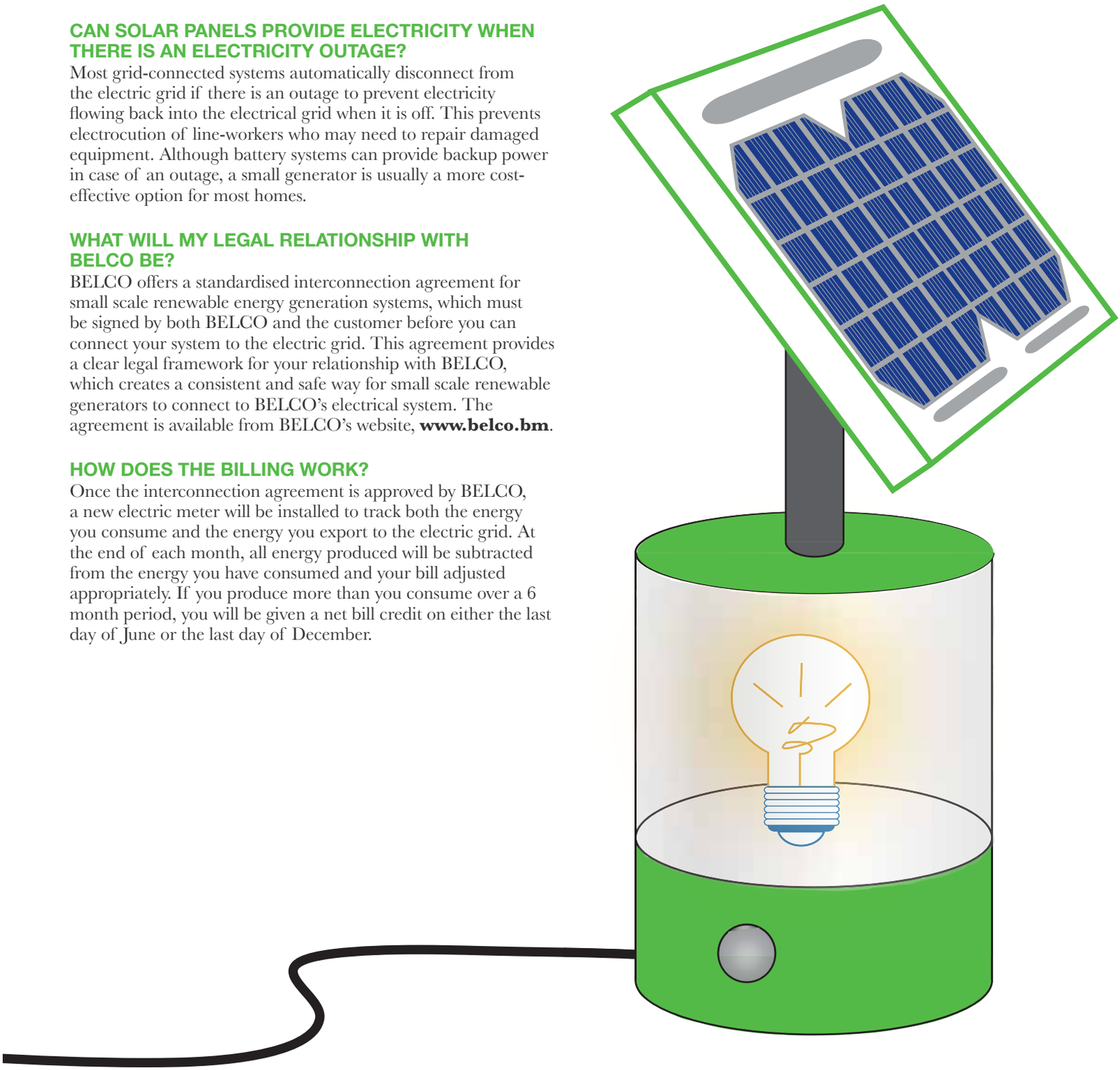
Most grid-connected systems automatically disconnect from the electric grid if there is an outage to prevent electricity flowing back into the electrical grid when it is off. This prevents electrocution of line-workers who may need to repair damaged equipment. Although battery systems can provide backup power in case of an outage, a small generator is usually a more cost-effective option for most homes.

WHAT WILL MY LEGAL RELATIONSHIP WITH BELCO BE?

BELCO offers a standardised interconnection agreement for small scale renewable energy generation systems, which must be signed by both BELCO and the customer before you can connect your system to the electric grid. This agreement provides a clear legal framework for your relationship with BELCO, which creates a consistent and safe way for small scale renewable generators to connect to BELCO's electrical system. The agreement is available from BELCO's website, **www.belco.bm**.

HOW DOES THE BILLING WORK?

Once the interconnection agreement is approved by BELCO, a new electric meter will be installed to track both the energy you consume and the energy you export to the electric grid. At the end of each month, all energy produced will be subtracted from the energy you have consumed and your bill adjusted appropriately. If you produce more than you consume over a 6 month period, you will be given a net bill credit on either the last day of June or the last day of December.



THE SOLAR PHOTVOLTAIC REBATE INITATIVE(SPRI)

WHO IS ELIGIBLE?

The SPRI is available to any residents of Bermuda who wish to install a solar photo-voltaic generation system on a residential dwelling which they own.

SPRI ALLOWANCE

The SPRI applicant will be awarded one dollar per Watt of installed DC photovoltaic panel capacity. The maximum SPRI allowance per applicant will be $5,000. Once you have selected an experienced and reputable installer, they should be able to assist you in determining the exact amount for which you are eligible.

SOLAR PHOTOVOLTAIC QUALITY STANDARDS AND INSTALLER CERTIFICATION

All solar photovoltaic panels used for the SPRI must be UL 1703 listed and inverters must comply with IEEE 1547 and UL 1741. The manufacturer of solar photovoltaic panels used for the SPRI should also provide a 25 year warranty on their performance and structural integrity.

NEXT STEPS

I WOULD LIKE A SOLAR PHOTOVOLTAIC SYSTEM FOR MY PROPERTY, WHAT DO I DO NEXT?

If you are interested in getting a solar photovoltaic system, then contact an experienced/reputable photovoltaic installer arrange for them to view your property to determine if it is suitable for the technology. The steps below provide an overview of the Government application processes involved in applying for a system, and an experienced/reputable installer should be able to assist you in completing the necessary applications.

STEP 1:

SELECT AN EXPERIENCED/REPUTABLE INSTALLER

STEP 2:

SUBMIT APPLICATIONS

CONTROLLED PLANT CONSTRUCTION PERMIT APPLICATION
Submit to the Department of Environmental Protection
Estimated cost: $174
Estimated process time: 1-3 months

CONTROLLED PLANT OPERATING LICENCE APPLICATION
Submit to the Department of Environmental Protecion
Estimated cost: $73
Estimated process time: 1-3 months

If the total collector area is 400 square feet or less and not located within a required setback submit the following application (call the Department of Planning if unsure of setback requirements):

PERMITTED DEVELOPMENT PERMIT
Submit to the Department of Planning
Estimated cost: $150
Estimated process time: 2 weeks

If the total collector area is more than 400 square feet submit the following applications:

DAP1 PLANNING APPLICATION FOR DEVELOPMENT
Submit to the Department of Planning and attach the following documents:

- 4 Location plans, showing the property outlined in red and access to the site highlighted in yellow.
- 4 Site plans, showing the position of the proposedsystem in relation to boundaries, buildings and existing vegetation.
- 4 elevation plans and/or photo montage, showing what the panels will look like.
- 3 Completed DAP1 applications forms, including details of the system dimensions, height, construction type and colour.
- A letter of acknowledgment signed by the owner of an adjacent property if located within a required setback (call the Department of Planning if unsure of setback requirements)

Estimated cost: $250 (retroactive application fee:$6000)
Estimated process tim: 2-5 months

BUILDING PERMIT APPLICATION
ONCE SYSTEM IS APPROVED
Submit to the Department of Planning
Estimated process time: 2 weeks

STEP 3:

INSTALLATION:

Once a building permit has been issued, (either a Permitted Development Permit or DAP1), various mandatory inspections by a building inspector are required during the system installation process.

The documentation that accompanies the building permit contains information for the mandatory required inspections. The Department of Planning will issue a Certificate of completion and occupancy once the system has been installed to the required standards as determined during the inspection process.

AFTER APPROVAL

SUBMIT APPLICATION

SPRI PAYMENT CLAIM FORM
Submit to the Department of Energy
Estimated process time: 2 weeks

SPRI Payment Claim Form must be submitted within 12 months of the Department of Energy receiving the **SPRI Application Form** to be eligible.

FOR MORE INFORMATION GO TO:

WWW.ENERGY.GOV.BM

TO CONTACT THE DEPARTMENT OF ENERGY:

Mailing Address:
P.O. Box HM 101
Hamilton HM AX
Bermuda

Tel: **(441) 292-4595**

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