NBF Electrical
www.nbfelectrical.com.au

WHY GO SOLAR?

NBF ELECTRICAL EXPLAINS WHY

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4.1 contents

WELCOME

And congratulations on taking the first step to obtaining a greener and more cost effective solution for your household and/or business electricity needs. NBF Electrical is very proud to help facilitate the rapidly growing network of homeowners and business owners who are not only reducing their carbon foot print, but also receiving a considerable amount of savings with a reduction in their electricity consumption.

I have provided some basic information for you to go over as a way to familiarize yourself with how solar electricity works and exactly what installation would mean to your home or business.

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ALL ABOUT SOLAR SYSTEMS 1.0

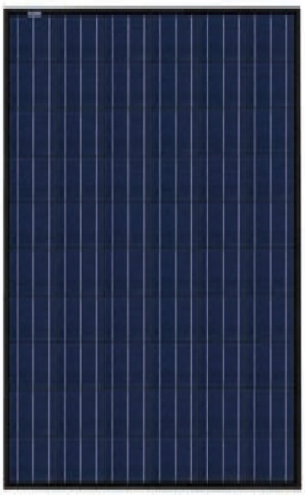
WITH HANDY TIPS!

1.1 How does solar work?

We use and recommend

panels.

Available in:
Black



and Silver

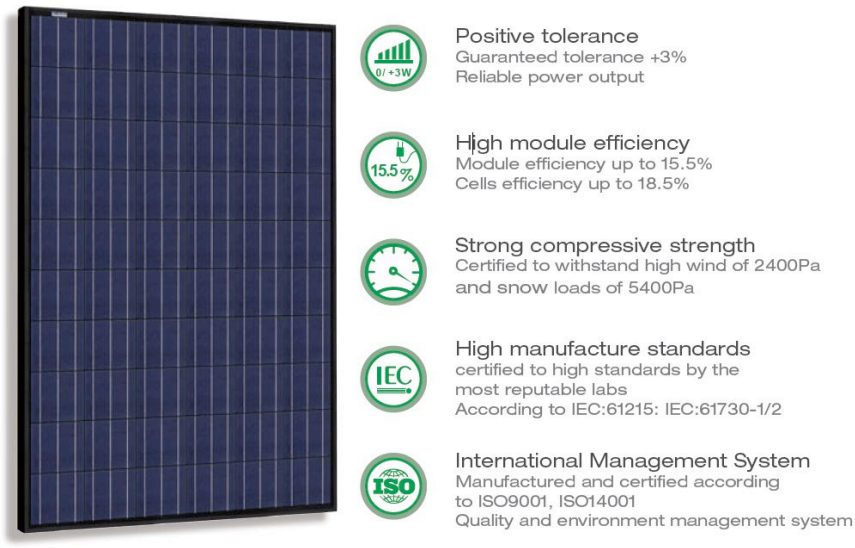
HOW DO SOLAR PANELS WORK?

Solar energy is light or heat that comes from the sun. Solar power is generated by transforming the light energy from the sun and converting it into usable electrical energy.

There are various types of solar power, what you are looking at is called a photovoltaic or a PV system for short.

The name 'photovoltaic' comes from the process in which light energy is converted into electrical energy. In this process light which is a stream of partials called photons hits the solar panel which contains silicon semiconductor. When the photons hit the silicon surface in the solar cell they generate electricity by transferring energy and freeing electrons from one side of the cell to the other.

The power produced in the panel is called direct current or DC electricity. The grid electricity we get from the road and are familiar with is a 230/400v alternating current or AC system. For this reason we cannot directly connect solar panels to the switchboard to power our appliances. We need an inverter to convert the DC power to AC power, letting you use the power of your system to power your home or business appliances.



HOW DOES A GRID-CONNECT SOLAR SYSTEM WORK?

A grid connected solar system consists of an array of solar panels (array being what we call the group of panels) that produce DC power. These are connected to an inverter, which convert the DC power produced by the panels into the AC power. The inverter is then connected to the switch board, allowing the power to be used. Any excess in production can be exported (sold back) to the grid (the road power), any short fall in production seamlessly gets imported (bought) from the grid. This is all recorded by what we call an Import/Export meter provided by SA Power Networks.

Put simply, PV cells are energy converters. The solar panels converts the light energy to DC power, which is then fed into the inverter to convert it to AC power. The AC power is in turn fed into the switch board as part of your 'normal' electricity supply.

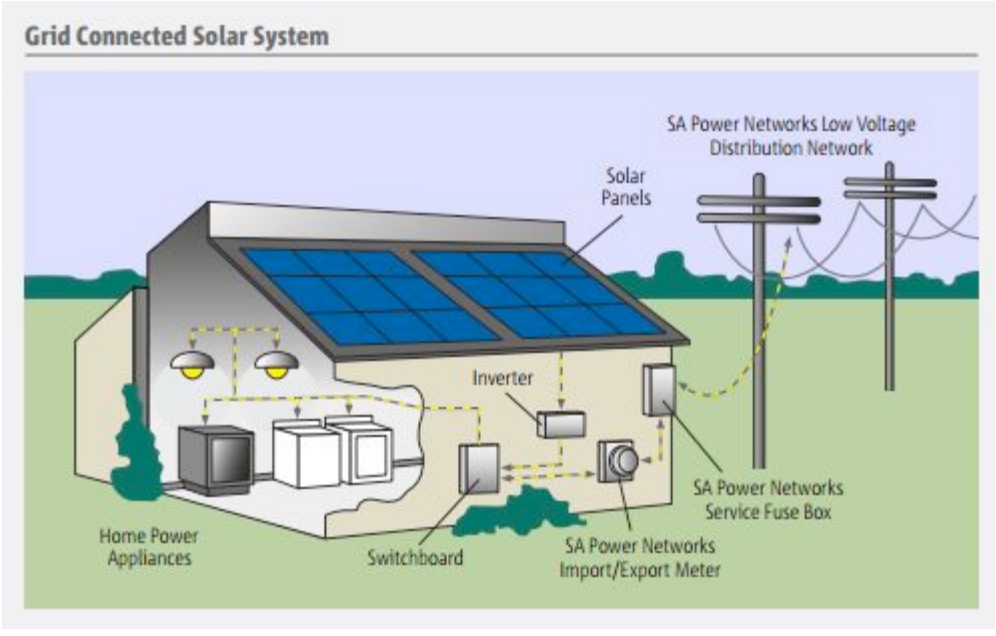
The system you will be looking at consists of the solar panels, one or multiple inverters (depending on the size of the system) which are connected to the switchboard and a metering device called an import/export meter which allows your system to be connected to the distribution network.

We use and recommend

SMA SOLAR TECHNOLOGY

and

SAMILPOWER inverters



1.2 What happens with my power?

Fact: *Solar panels produce more energy in summer than they do in winter.*

HOW MUCH POWER WILL I PRODUCE?

In Adelaide, the average number of hours per day that will produce the rated power of the PV system is 4.4. This takes into consideration that early morning sunlight and late afternoon sunlight do not produce the full rated power.

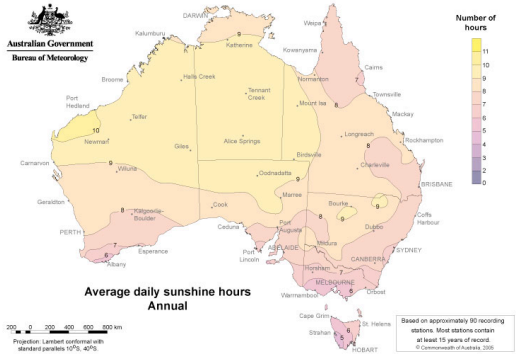
E.g. If you had a 5kw system you would multiply it by 4.4 and you would expect it to produce 22kw/h per day. Generally we work on a multiplication of 4x the system size as this gives a 10% loss in the estimated production to account for the losses from the total system, such as the inverter and the cables.

Figures provided are an approximate guide only, as over grown trees, dirty panels and time of year could significantly affect the overall performance of the system.

Note: This data is calculated based on average sunlight data for Adelaide supplied by the Australian Bureau of Meteorology and the Clean Energy Council.

Average daily production					
City	1 kW system	1.5 kW system	2.0 kW system	3.0 kW system	4.0 kW system
Adelaide	4.2 kWh	6.3 kWh	8.4 kWh	12.6 kWh	16.8 kWh
Alice Springs	5.0 kWh	7.5 kWh	10.0 kWh	15.0 kWh	20.0 kWh
Brisbane	4.2 kWh	6.3 kWh	8.4 kWh	12.6 kWh	16.8 kWh
Cairns	4.2 kWh	6.3 kWh	8.4 kWh	12.6 kWh	16.8 kWh
Canberra	4.3 kWh	6.45 kWh	8.6 kWh	12.9 kWh	17.2 kWh
Darwin	4.4 kWh	6.6 kWh	8.8 kWh	13.2 kWh	17.6 kWh
Hobart	3.5 kWh	5.25 kWh	7.0 kWh	10.5 kWh	14.0 kWh
Melbourne	3.6 kWh	5.4 kWh	7.2 kWh	10.8 kWh	14.4 kWh
Perth	4.4 kWh	6.6 kWh	8.8 kWh	13.2 kWh	17.6 kWh
Sydney	3.9 kWh	5.85 kWh	7.8 kWh	11.7 kWh	15.6 kWh

The rated output is that achieved in perfect laboratory conditions. The CEC design summary software takes these deratings into account when predicting average for any given system.



Fact: *Grid connect solar works on a seamless 'push/pull' principle so there is no noticeable blip with the transition from using your own electricity to grid electricity.*

WHAT HAPPENS TO THE POWER PRODUCED?

Using the kWh/day worked out from for a 5Kw system as a guide, it is estimated that half of this power would be used in the house, and the other half of the power would be exported. This is assuming that all the panels are facing the same direction as this will make a higher peak production over a shorter time.

If some of the panels are facing in different directions for example, East and West, even though the peak production would be lower at any one point in time, the overall length of production would be longer. Generally in this case you will find that 1/3 of production is exported while 2/3 of the power is used.

The feed in tariff is now lower than it used to be, due to the government stopping contributions on the power you export. The government does however still help offset the purchase price of the system. Power retailers will still give you some money for the power exported. This is around $0.085 per Kw/h.

In order to have the biggest savings, you should export less of your peak power. One way of doing this is using your high power appliances like the washing machine during the day rather than at night. Another way we can achieve this, is to set panels up in multiple directions. This then gives a more steady generation period so that you do not have to import as much power throughout the day at the higher price, meaning a bigger saving for you.

Given this, it is best to have some panels facing:

- East for strong production in the morning
- North for highest production in the middle of the day but still strong in the morning and afternoon
- West for strong in the afternoon

1.3 What size system, and where do the panels face?

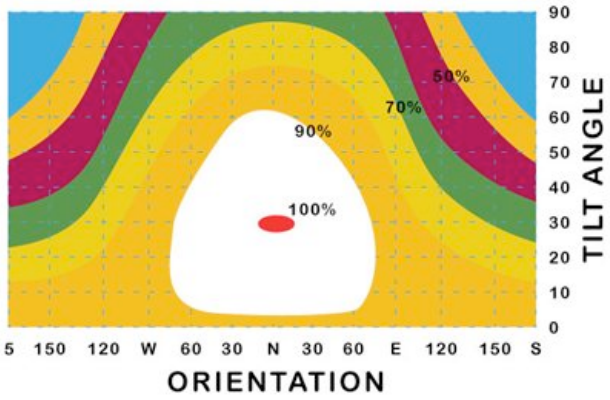
Fact: *Steep angled panels are more efficient in winter, whereas shallow angled panels are more efficient in summer.*

WHAT IS THE BEST PANEL ORIENTATION?

In the southern hemisphere, North facing panels are the best for overall solar production. The production of power is slightly lowered the more we move away from true North and the more we change the angle of the panels, but this can be mitigating by increase the production time range hence importing less power during the day. If the panels are kept at a low pitch there is very little difference in output production.

At 25 degree pitch:
North – No Losses
North East/North West – approximately 7% loss
East/West – approximately 15% loss
South – approximately 40% loss

Depending on the time of year it is, summer or winter, the solar panels work more efficiently with different tilt angles. Regardless of what angle your roof pitch is within reason anywhere from 7-30degs works well. Panels lying flatter will produce more in summer and panels that are steeper will produce more in winter. In most cases what is lost at one point in the year is gained back later on in the year.



At NBF Electical, we could reduce your power bill by half, or even eliminate it completely!

WHAT DOES THIS MEAN FOR ME AND WHAT SIZE SYSTEM DO I NEED??

This is where we need to look at your power bill, and your current power usage. On the bill it will state how many kW/h per day you use and also the cost of the power. There is also a supply charge per day and different price brackets depending on how much power you use.

This can all get very confusing, so the best thing to do is work out how much power, in dollars, you use per year. You can do this by looking over your past power bills and adding them up or simply multiplying your current bill by 4 if your winter and summer usage is about the same.

If we were simply to look at t he power bill and see how many kW/h we use per day and then pick a system that makes the same amount of Kw/h's per day would that cancel the bill?

Sadly no, it will not, as some of the power you use will be at night when the sun is down plus there are also the service charges. You will need to export extra power during the day to help overcome this. It can be hard sometimes due to the size of your roof or cost of the system to get a completely neutral power bill now that the feed in tariff is lower, but if you could reduce your power bills by half or even three quarters would you still be happy?



Example residential NBF installations

1.4 How do you calculate system size?

LET'S CREATE A SCENARIO!

Example situation 1:
Power usages of 18kW/h per day, with a bill of $604.80 per quarter, or $2426.00 per annum.

If we choose a 5kw PV system we know from the previous scenario on Page 8 that it will produce, on average, 20kW/h per day so in theory it produces more than what is being used and would cancel the bill completely, but it's not that simple.

On your power bill you will see that there are different price brackets depending on how much power you use. The average price is around $0.35 per Kw/h. You will also find a 'service to property' charge, that is what you are charged just for having power connected to our property. Depending on the retailer it is normally around $0.60-0.75 per day. When you export power to the grid, again depending on the retailer you are with, it is between $0.08-0.09 per Kw/h.

So now you can see that even if we take the better case of $0.60 per day in supply charge before you have even used any power you need to export about 7.5Kw/h just to overcome this cost.

As you can see that even though a 5kw system produces more than the usage in this example it still would not be able to completely offset the bill. To work out how big the system would need to be, we must look at the power usage over a full year. This allows us to more accurately estimate both your usage season to season and the production output of your new system.

On average, half the power used per day is used during daylight hours and the other is at night. Therefore, 9Kw/h per day will not be exported as the energy will get used straight from the solar system and the other 9Kw/h will need to be offset with the service charge.

HOW DO I GENERATE AS MUCH POWER AS I USE?

In order to completely offset your bill, the following needs to be considered:

- $0.60 service fee per day plus
- 9Kw/h used at night works out to be worth 9 x 0.34 (the import price) + the $0.60 = $3.66 per day
- This $3.66 equates to 40.6Kw/h worth of exporting power
- Then you still need to add the 9Kw/h used during the day

All this means you need to make almost 50Kw/h per day to completely offset the bill. Now, we know from Page 8 that to work out what size system we need, we divide this 50Kw/h by 4 the hours per day the system produces is rated power. This gives us a system size of 12.5Kw.

From this you can see that is it possible to overcome your power bills, but more power has to be produced than you use. Alternatively, if you can use most of your power during the day light hours by perhaps setting a timer on the washing machine to start its cycle in the middle of the day, run pool filters when the sun is out etc., this could help to bring the system size down considerably. Furthermore, this is where having panels facing in different directions becomes a more viable option - to maximise capture of light available to the panels.



Example residential NBF installations

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EXAMPLE PV SYSTEMS 2.0

AND THEIR CALCULATIONS EXPLAINED

2.1 Example 5Kw PV System

Fact: *A 5KW PV Solar system could save you more than $30,000 over its life!*

OVERVIEW OF A 5KW PHOTOVOLTAIC SYSTEM

From a 5KW system it is estimated to produce 20Kw/h per day.

If all the panels face the same direction, then generally half the produced power is exported. So 10 Kw/h saving from not importing and 10Kw/h would be exported.

If some of the panels are facing in different directions, for example East and West, then even though the peak production will be lower the overall length of production will be longer so we generally find that 1/3 of production is exported while 2/3 of power is used. So 13.4 Kw/h saving from importing and 6.7Kw/h would be exported.

As the feed in tariff is now lower, this will mean that you should export less of your peak power while having a steady generation period of not importing power throughout the day, meaning a bigger saving to you.

With all panels facing the same direction:
10 KWh/day saved from being imported @ $0.3382 = $3.4/day
10KWh/day exported @ $0.098= $0.98/day
Total Saving of $4.38 per day, $394 per 90 days and $1598 per year.

With panels facing the different directions:
13.4 KWh/day saved from being imported @ $0.3382 = $4.50/day
6.7KWh/day exported @ $0.098= $0.66/day
Total Saving of $5.16 per day, $464 per 90 days and $1883 per year.

This equates to a saving of nearly $300 a year by having a multi direction PV array setup.

Here, the system is paid back in 4-5 years meaning a minimum of a 20% return on investment.

The 5kw system should produce around 7300Kw/h per year and save you more than $30,000 over the next 20 years in power bills at the current power prices.

Since the price of power is always going up the savings will be even more!

Note: All calculations are an estimate only, as time of year and time of power usage will significantly change the amount saved.

2.2 Example 10Kw PV System

Fact: *A 10KW PV Solar system could save you more than $60,000 over its life!*

OVERVIEW OF A 10KW PHOTOVOLTAIC SYSTEM

From the 10KW system it is estimated to produce 40Kw/h per day.

If all panels face the same direction, then generally half the produced power is exported. So 20 Kw/h saving would be from not importing and 20Kw/h would be exported.

If some of the panels are facing in different directions for example East and West then even though the peak production will be lower the overall length of production will be longer and we generally find that 1/3 of production is exported while 2/3 of power is used. So 26 Kw/h saving from importing and 14Kw/h would be exported.

As the feed in tariff is now lower this will mean that you should export less of your peak power while having a steady generation period of not importing power throughout the day meaning a bigger saving to you.

With all panels facing the same direction:
20 KWh/day saved from being imported @ $0.3382 = $6.77/day
20KWh/day exported @ $0.098= $1.8/day
Total Saving of $8.57 per day, $771.3 per 90 days and $3128 per year.

With panels facing different directions:
26 KWh/day saved from being imported @ $0.3382 = $8.8/day
14 KWh/day exported @ $0.098= $1.37/day
Total Saving of $10.17 per day, $915.48 per 90 days and $3,712.80 per year.

This equates to a saving of around $600 a year by having a multi direction PV array setup.

Here, the system is paid back in 4-5 years meaning a minimum of a 20% return on investment.

The 10kw system should produce around 14,500Kw/h per year and save you more than $60,000 over the next 20 years in power bills at the current power prices.

Since the price of power is always going up the savings will be even more!

Note: All calculations are an estimate only, as time of year and time of power usage will significantly change the amount saved.

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WHY CHOOSE NBF ELECTRICAL?

3.0

3.1 The NBF Difference

Did you know: *There are different price brackets for power, depending on how much power you use?*

BE PROVIDED WITH A SYSTEM OVERVIEW

NBF Electrical offers all their clients a tailored system design which fits within their needs and budget. From this foundation we can discuss which of our quality products will be used in your PV system comprising of the following:

- Total number of PV panels to be installed
- Location of PV panels. e.g. house/shed/warehouse/ground mount
- Type of roof they will be installed on, e.g. tin/tile/etc.
- Direction the panels will be facing East, North or West
- Size and brand inverter will be used and how many tracking MPPT's will be needed to maximize power collection, matched to the size of the system complying with Australian Standard AS4777.
- CEC Certified mounting system.
- Wiring, volt rise/drop calculations, circuit breakers and required string protection.

INSTALLATION

Your installation will be conducted by NBF Electrical using our qualified and accredited installers and will not be sub-contracted out. Our team comprises of highly trained and experienced licenced electricians and supervised apprentices. At NBF Electrical, we take great pride in doing the job right first time every time.

We have a few very simple rules which are cemented into our culture: If it is not 100% right, then it is wrong, if it is wrong, it has to be fixed. If we can spend an extra hour now to make something neater or make the system produce more power, we do it, and we always leave the premises in as good if not better condition. No rubbish will be left on site, as we respect you and your premises as it is our own and appreciate the investment you have made.

NOT JUST SOLAR

At NBF Electrical we perform all types of electrical work. Ranging from replacing a light switch, adding a power point, a new light fitting right up to a full rewire. We can also advise about and install many energy efficient products such as LED lighting, motion sensors, timers and inverter technology air conditioning.

OUR TEAM

We do not have full time salesman taking their commission out and inflating the cost of your system, we do not utilise mass marketing in the hope to pick up work. Much of our work is generated through happy and satisfied customers commending our team. We are focused and pride ourselves on taking a personal approach creating the most practical, sustainable, and affordable solutions for both our clients and the environment. This has proven very successful thus far.

Being a small South Australian business we have reduced overheads which allow us to pass on even further savings in the price of the system. By using NBF Electrical, you will also be supporting someone in your local state - a local business; and not sending money interstate - or worse overseas.

We provide this excellent service to our residential, commercial and industrial sectors, working between Metropolitan Adelaide, to the remote country, NBF Electrical will assist you with every step.

A WARRANTY YOU CAN TRUST

A smooth and painless install is only the start of the NBF Difference. The service does not stop once we get paid. Should you have any questions in the future which are not answered in either this pack, on site or in your post install pack we encourage you to contact us.

In the extremely unlikely event of something going wrong either during or after an install you can feel safe knowing you are covered under our $10,000,000 public and product liability insurance.

Warranty duration on all materials as per manufacturers warranty:

- 5 year warranty on inverter (with 10 year option)
- 12 year product guarantee on panels
- 90% of panel output after 10 years
- 85% of panel output after 25 years
- 10 year guarantee on mounting system
- 2 year workmanship guarantee

3.2 Energy Profiling

SAVING YOU MORE MONEY

At NBF Electrical we not only use solar power to reduce your energy usage we are also able to perform energy profiling across your facility. This is the process of identifying opportunities for energy savings and provides you with the data you need to address them.

With our single and three phase electrical energy logger we can comprehensively log measurements like voltage, current, power and power factor. We can do this few multiple times a minute to give a very detailed and accurate look at not only your peak usage but the time of usage throughout a day or even a week.

This data logging service is primarily for our larger install clients but it is available to anyone for a small fee. In most cases this fee is negated if a solar install goes ahead. In all cases we look for things that stand out such as what lights you have, how old your air conditioner is and any older appliances that may not be working as efficiently as they could be.

By replacing Halogen down lights with LED down lights you can save up to 40w a fitting - meaning you could run 5x LED down lights for the same cost on one 50W halogen fitting! We can also discuss LED flood lights and commercial LED and florescent lighting.

Another major advantage of being able to log your demand over time is the ability to be able to pin point what time of the day most of your power is being used. This allows us to better design your solar system because we can face your panels in the direction which saves you the most power from being imported from the grid.

Electrical Energy Logger

Energy Logger in use

NBF Electrical

OUR WORKMANSHIP 4.0

4.1 Installation Gallery

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