

There is a terrible amount of misinformation in the Dominican Republic about solar systems that has resulted in investors enduring terrible consequences and losing tremendous amounts of money when they buy a solar system. With the right knowledge these painful experiences can be avoided. Therefore EEN/meeco wants to ensure our clients are well informed and well educated regarding solar systems so you make the right decision for your important long term 25 to 30 year investment to ensure profitable returns.

Energy Experts Now & meeco have prepared this invaluable, important money saving information to help you better understand solar power systems and give you the power and the knowledge to answer relevant and important questions that enable you to make the solar power decision that is the right choice for you and your company.

- ⇒ *Did you know a poor quality inverter can cause humming and buzzing in your electrical equipment, fans, motors and lighting. Why listen to a noisy inverter for 25 years ?*
- ⇒ *Do you why know a monocrystalline panel is superior to a polycrystalline solar panel ? Invest now in the best panels so you don't suffer down the road.*
- ⇒ *Did you know underated wind loads for cheap panels can cause failures in high winds ?*
- ⇒ *Do you know the difference between UL and CE certification and why you need it ? Hint , UL certified costs more money but it's required by the regulations and it's a higher quality USA standard certification.*
- ⇒ *Do you know what direction your panels should face and be installed at what degree of tilt ? You can lose 10 to 15 percent of solar power from incorrectly installed panels. Read more about catastrophic failures !!*
- ⇒ *Did you know there is a huge difference between solar cables and normal electrical cables ? Cables have to last the life of the project , 25 years or you can have huge repair costs.*
- ⇒ *Hot spots cause fires. How do you avoid them ?*

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- ⇒ *What is a flash test of the solar panels and how can it make you a lot more money ?*
- ⇒ *What is the difference between a 2 year panel warranty and a 25 year warranty ? Don't get ripped off.*
- ⇒ *Why do many businesses choose lead acid deep cycle batteries vs lithium ion ? Cheaper does not mean better.*
- ⇒ *Why should you always buy a separate O&M package with your solar system ? You may lose a lot of money over time in lost power generation.*
- ⇒ *How does "degradation" cost you a lot of money ? Beware of cheap solar panels!*
- ⇒ *Do you know there is a huge tax credit available for commercial solar panel installations ? Reduce your costs and have the government pay for up to 40 % of your installation.*
- ⇒ *Do you know how to determine if the company offering you solar power is qualified ? Fly by night companies offer flimsy or no guarantees.*
- ⇒ *Did you know EEN can help you with up to 70 % financing for your system ? Let our banks help you.*

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**Solar power – you don't get something for nothing, there is a trade off on price vs efficiency vs output.**

### Most efficient solar panels: the top 6 in 2020

Here are the top five best solar panel manufacturers in 2020 ranked based on the highest efficiency solar panel they have to offer: (most panels sold in the DR are 15 to 19 % )

1. SunPower (22.8%)
2. LG(21.7%)
3. REC SOLAR (21.7%)
4. **OURSUN (20.5 %) offered by EEN / meeco**
5. Panasonic (20.3%)
6. Silfab (20.0%)

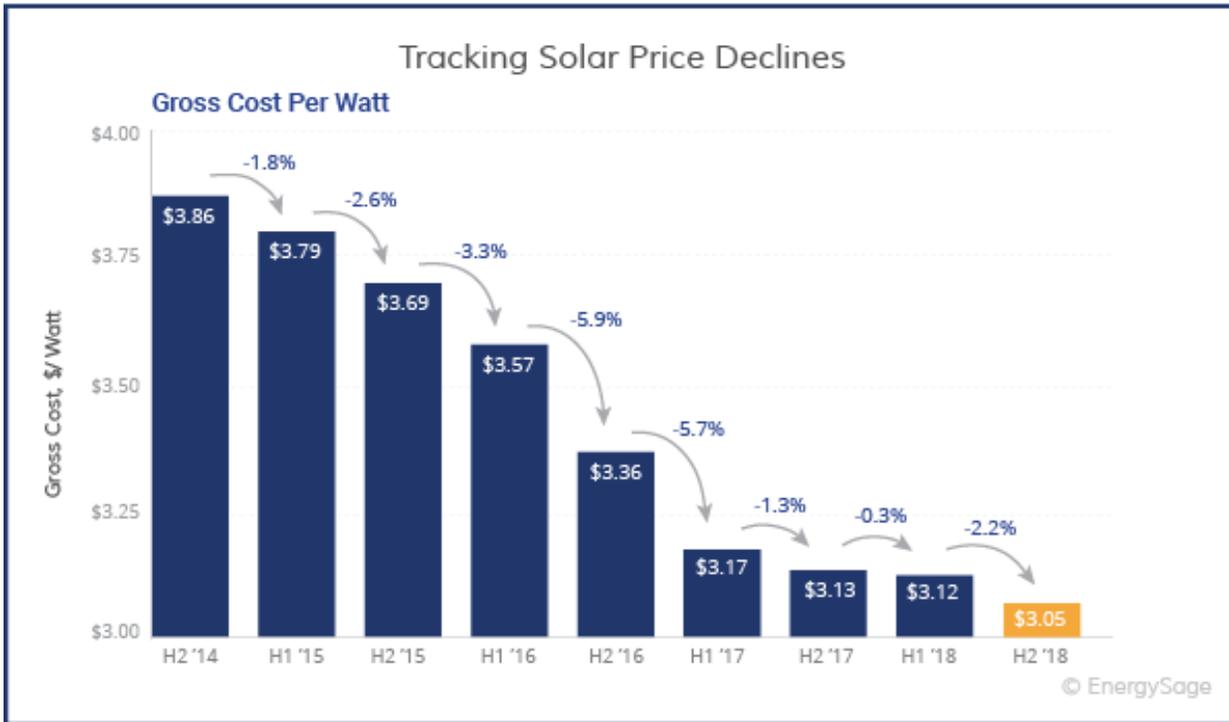
The most efficient solar panels on the market today have efficiency ratings as high as **22.8%**, whereas the majority of panels range from 15% to 17% efficiency rating. **SunPower** panels are known for being the most efficient solar panel brand available on the market, they will come with a much higher price tag. Most panels sold in the Dominican market are 15 to 18 % efficient. **Check before buying as a 15 % efficient panel makes 5 % less power than a 20 % efficient panel.**

### The cost of solar energy

Concurrent with an increase in solar panel efficiency, the cost of solar energy has fallen substantially. In the last decade alone, the cost of a solar panel installation fell over 60 percent Residential rooftop solar is now around \$ 3.00 USD per watt in the USA. Commercial and industrial installations are around \$ 1.83 USD per watt.

Yet in the Dominican Republic commercial and industrial solar systems range from 90 cents per watt to \$ 1.10 per watt, far less that the USA. You need to able to understand why. **Needless to say any solar system being sold for less than \$ 1 USD per watt is probably not going to be a high quality system and you should be asking a lot of questions.** Unfortunately many low cost unreliable solar energy installations are taking place here now and this is concerning as the reputation of solar power is at risk of being damaged due to poor quality installations and equipment.

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## The major types of solar panels

Generally speaking, your options for types of solar panels are **monocrystalline, polycrystalline, and thin-film panels**.

Each type has its own unique advantages and disadvantages, and the solar panel type best suited for your installation will depend on factors specific to your own property and desired system characteristics.

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Solar panel type	Advantages	Disadvantages
Monocrystalline	<ul style="list-style-type: none"> <li>• High efficiency/performance</li> <li>• Better Aesthetics</li> <li>• Better degradation</li> <li>• More Reliable</li> <li>• One solid piece of silicone</li> </ul>	<ul style="list-style-type: none"> <li>• Higher costs</li> </ul>
Polycrystalline	<ul style="list-style-type: none"> <li>• Lower cost</li> </ul>	<ul style="list-style-type: none"> <li>• Lower efficiency/performance</li> <li>• Only 7 years in market not proven</li> <li>• Not made from one solid silicone wafer</li> <li>• More complex = higher failure rate</li> </ul>
Thin-film	<ul style="list-style-type: none"> <li>• Portable and flexible</li> <li>• Lightweight</li> <li>• Good for roofs that wont accept much weight</li> </ul>	<ul style="list-style-type: none"> <li>• Lowest efficiency/performance</li> </ul>

### Different types of solar panels have varying costs

The manufacturing processes differ between monocrystalline, polycrystalline, and thin-film; as such, each type of panel comes with a different price tag.



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## Monocrystalline solar panels

Of all types of solar panels, monocrystalline panels are likely to be the best albeit the most expensive option. This is largely due to the manufacturing process - because the solar cells are made from a single silicon crystal, manufacturers have to absorb the costs of creating these crystals. This process, known as the Czochralski process, is energy intensive and results in wasted silicon (that can later be used to manufacture polycrystalline solar cells). However you are investing for 25 years so why take a chance on cheaper panels ?



## Polycrystalline solar panels

Polycrystalline solar panels are typically cheaper than monocrystalline solar panels. This is because the cells are produced from silicon fragments rather than a single, pure silicon crystal. This allows for a much simpler cell manufacturing process, thus costing less for manufacturers and eventually end users but they have a higher failure rate.



## Thin-film solar panels (think carports and other light duty roofs)

What you pay for thin-film solar panels will largely depend on the type of thin-film panel; CdTe is generally the cheapest type of solar panel to manufacture, while CIGS solar panels are much more expensive to produce than both CdTe or amorphous silicon.

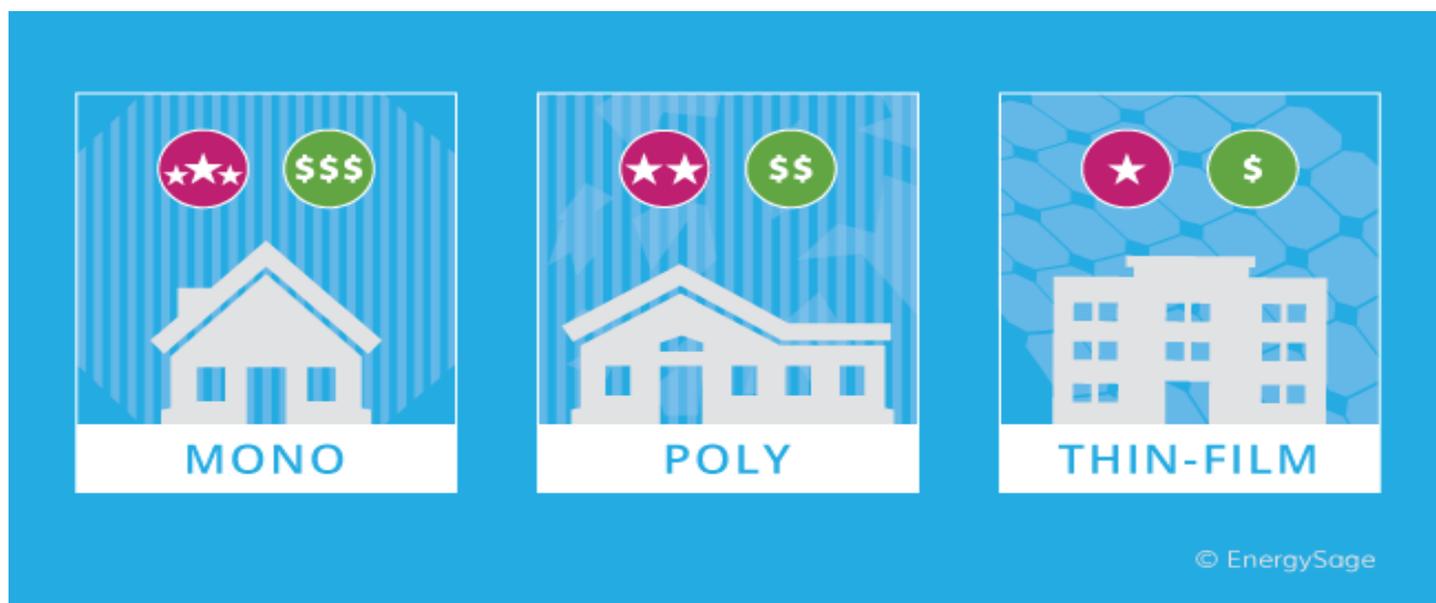
## Type of panel best for your installation

As you're choosing the type of solar panel you'd like for your system, much of your decision will come down to the specifics of your property and situation. Monocrystalline, polycrystalline, and thin-film panels each have their own advantages and disadvantages, and the solution you should move forward with depends on your property and your goals for the solar project. If you are in a hurricane zone CHECK the maximum wind loads !

Property owners with a lot of space for solar panels can save money by installing lower efficiency, lower-cost polycrystalline panels. If you are looking to maximize your electric bill savings, you can do so by installing high-efficiency, monocrystalline solar panels.

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As far as thin-film panels go, it's most common to choose this type of solar panel if you're installing on a large, commercial roof that cannot handle the additional weight of traditional solar equipment. These types of roofs can also afford the lower efficiencies of thin-film panels because they have more area to place them on.



**What is solar panel degradation and what does “degradation rate” mean?**

It might sound ominous, but “degradation” is just an industry term used to describe the decline in output that all solar panels experience over time. In fact, were he around today, Ben Franklin would no doubt have added solar panel degradation to [his famously short list of life’s certainties](#).

So, if you're wondering, “Do solar panels degrade over time?”, the short answer is “Yes.” All solar panels degrade. **But they don't all degrade at the same rate**—that's what matters and warrants a closer look. In their first year of operation, panels typically undergo short-term degradation ranging from less than 1% to 3%. After that, according to a recent study, solar panel performance declines by an average of 0.8% to 0.9% each year.

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For example, if a panel’s first-year, short-term degradation was 2%, it would be operating at 98% efficiency going into year two. From that point, assuming it degrades at 0.8% per year thereafter, it would still be operating at 78.8% efficiency in year 25. **So you can see a low cost panel up front may cost you more money over the long term of the project.**

Now, you’re probably wondering, “How long do solar panels last anyway?” That’s a good question. Comprehensive testing done by commercial solar panel manufacturers suggests that the lifespan of solar panels is somewhere between 25 to 40 years, depending on the manufacturer.

That doesn’t mean panels stop working or generating electricity after that time. It simply means their energy production has declined to a point beyond what manufacturers refer to as a panel’s “useful life.”

### What impact can commercial solar degradation rates have on your business?

We’ve seen how an *average* solar panel would degrade. But what if you’re considering a panel that degrades more quickly, perhaps at a rate of 1.0% each year—or more slowly, such as a rate of just 0.25% each year? Is that a big difference?

**It definitely can be. The fact is, those six- or seven-tenths of a percentage point in degradation rate could add up to thousands of kilowatt-hours of energy lost every year**, depending on the number of panels and how long they’ve been generating electricity. That means you could end up spending money by having to draw power from the grid, rather than from your installed solar panels. For a large commercial installation, that could mean hundreds of thousands of dollars over the system’s lifetime.

**That’s why it’s important to consider whether it would make better long-term financial sense to save upfront on lower-quality panels with a higher degradation rate, or invest in higher-quality (and potentially more expensive) panels that degrade more slowly. You should always compare the potential cost savings upfront as you evaluate your options.**

The difference in degradation rate can translate into a significant amount of money over the next 10, 15 or 25+ years.

### Warranty: Knowing exactly what’s covered, who pays for what and for how long

We’ve discussed efficiency, durability, degradation rate and performance when it comes to your solar panels, but there’s one more important topic to cover: The warranty. Understanding if and how your solar panels will be replaced—and how disruptive the replacement process could be to your business—is **just as essential to your decision as any other feature.**

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Typically, all solar panels come with: 1) a product warranty covering the product against defects; and 2) a power warranty covering a minimum guaranteed power rating for a period of time.

These two warranties can either be for the same period of time (25-year combined) or for different periods (10-year product, 25-year power)—and may or may not include the service required to replace defective or underperforming panels.

As you evaluate the long-term financial impact of a solar investment for your business, be sure to factor in the potential costs associated with any product and power warranty claims. If they aren't concurrent, find out what will be covered by a panel's power warranty once the product warranty runs out. Weigh the short-term savings that may come with less-expensive panels against the long-term impact of possible higher return rates and replacement costs. And understand what steps you'll need to take should a panel require replacement. The fewer surprises, the better.

**The key questions for evaluating and comparing solar panel warranties:**

- *What product and power warranties are offered? How long does each one last?*
- *What exactly is covered by the product warranty? For example, if a panel malfunctions, what will you be expected to pay—and how long will it realistically take—to have the old panel removed and a new panel shipped and installed?*
- *If the power warranty that comes with the solar panels is longer than the product warranty, what's covered if a product defect causes power loss?*
- *What does the panel or inverter replacement process look like?*
- *Who will provide the warranty ? The local company ? What if they go out of business ?*
- *Are there spare panels in the country ?*

**Beware as a “cheap” offer from a potential supplier may either have a weak warranty or they will not have built warranty service into the price meaning you may have trouble making claims later on.**

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## The Real Lifespan of Solar Panels

Solar panel manufacturers put a lot of effort into making their solar panels robust. EEN / meeco offer 50 mm thick frames, the best in the market. They need to be able to withstand heat/cold cycles and heavy weather. However, solar panels are not perfect and they will inevitably age. Keep reading to find out how age affects performance and what this actually means.

### How fast do solar panels degrade/lose their efficiency?

The rated power output of solar panels typically degrades at about 0.5%/year. However, thin-film solar panels (a-Si, CdTe and CIGS) degrades faster than panels that are based on mono- and polycrystalline solar panels:

Solar cell type

Output loss in percent per year

Monocrystalline silicon (mono-Si)

Pre

Post

0.47

0.36

Polycrystalline silicon (poly-Si)

0.61

0.64

Solar panels typically degrade faster in the first couple of years of their life and as you can see Poly panels degrade faster, one more reason why they are cheaper.

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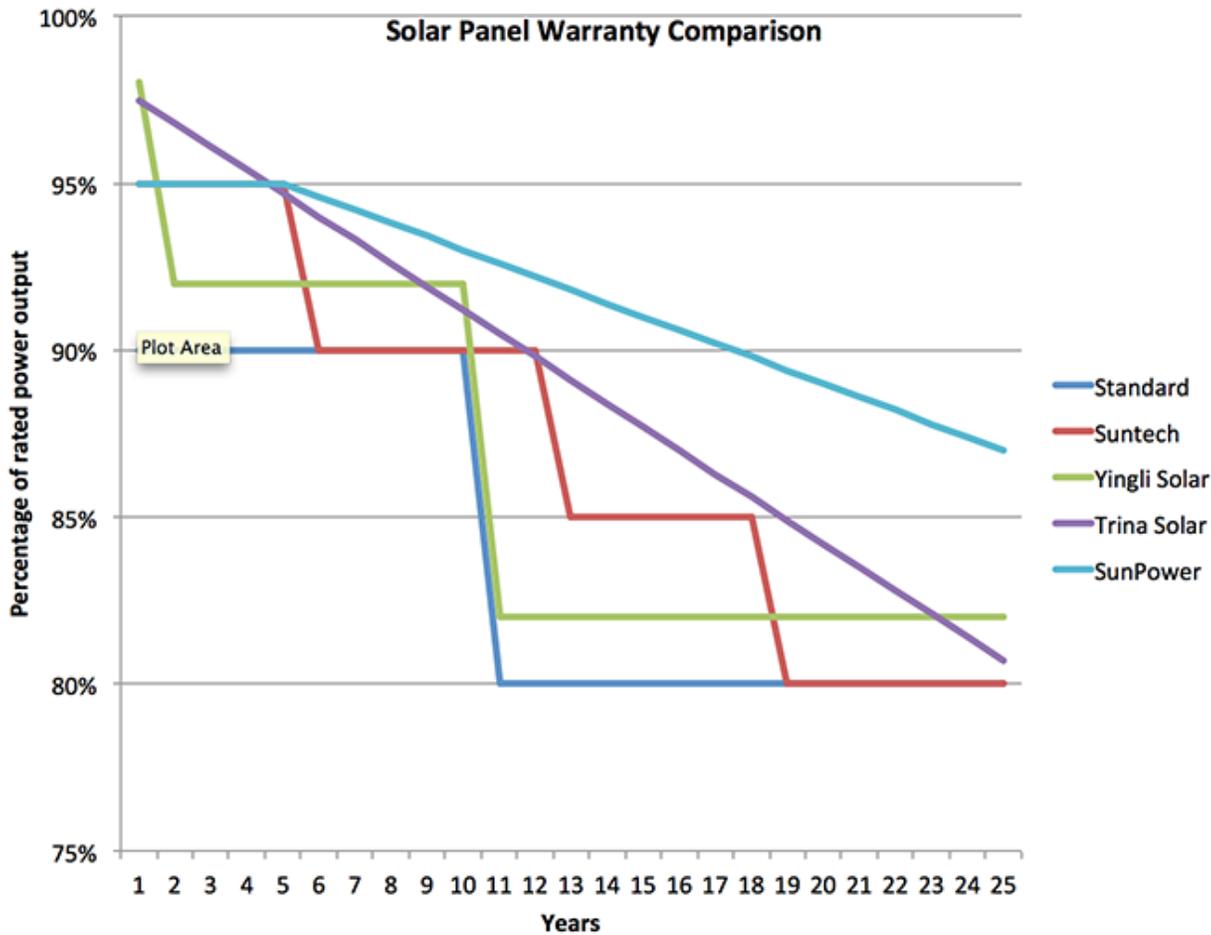
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## What is the life expectancy of solar panels?

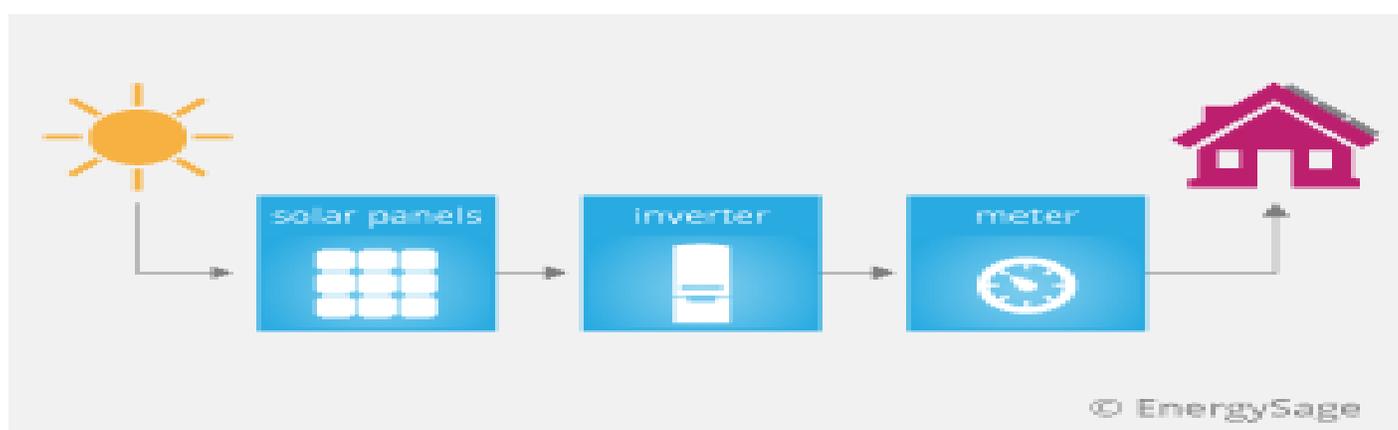
Below is a chart showing different solar panel warranties on the market today. The different manufacturers guarantees that the performance of their solar panels will stay above the following ranges:



The majority of manufacturers offer the 25-year standard solar panel warranty, which means that power output should not be less than 80% of rated power after 25 years. However its very important how fast that degradation i

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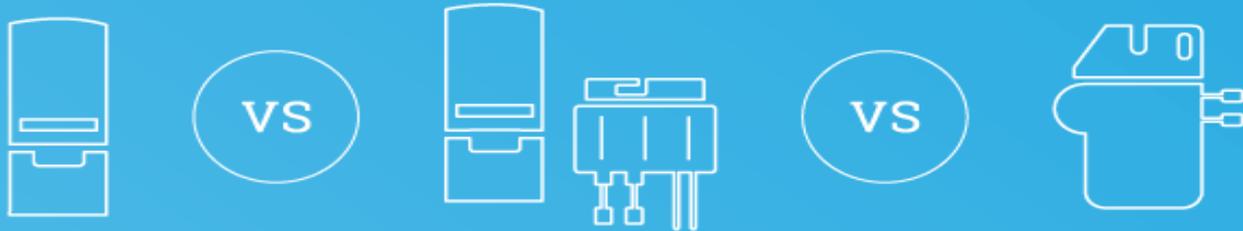
**String inverters vs. power optimizers vs. microinverters (the data regarding microinverters are only for your information as microinverters are very expensive and are not at all common in the Dominican Republic)**



If you are considering a solar panel system for your home, one of the key decisions you make is the type of inverter to install. Inverters convert direct current (DC) energy generated by your solar panels into usable alternating current (AC) energy. After the panels themselves, **inverters are the most important equipment in your solar power system.** (Note in the DR almost all installations are string inverters) EEN/meeco use Fronius Inverters who are consistently rated as the top # 1 or # 2 inverter in the market. <https://www.cleanenergyreviews.info/blog/best-grid-connect-solar-inverters-sma-fronius-solaredge-abb>

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# Individual Panel Performance

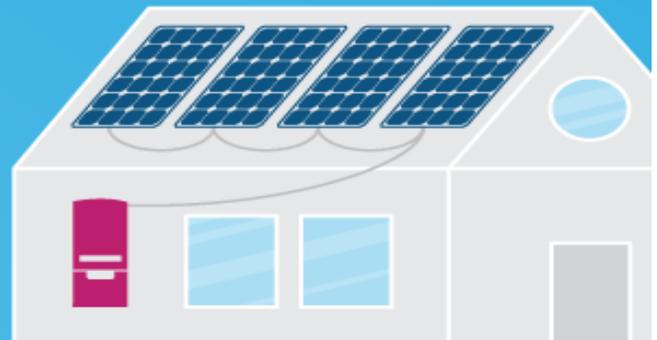


## STRING INVERTERS

centralized DC to AC conversion



- ⊖ system only produces as much electricity as its least productive panel
- ⊖ system level monitoring only
- ⊖ production reduced if individual panels are shaded or soiled



## STRING INVERTERS + POWER OPTIMIZERS

centralized DC to AC conversion



- ⊕ panels optimized independently
- ⊕ system and panel level monitoring
- ⊕ works well in shade and produces more energy



## MICROINVERTERS

panel level DC to AC conversion

## Breaking down solar panel inverter technologies: string inverters, power optimizers, and microinverters

There are three types of inverters that are currently available to you for your solar energy system: **string (also known as centralized) inverters**, **power optimizer systems (also known as string inverters + power optimizers)**, and **microinverters**. Microinverters and power optimizers are often collectively referred to as “Module-Level Power Electronics” or MLPEs.

String inverters are by far the most commonly deployed option globally and comprise the vast majority of the world’s inverter market including the Dominican Republic. However, MLPE technologies are rapidly gaining popularity and market share as their costs have come down. Despite the global dominance of string inverters, GTM Research found that over half of all residential solar systems installed in the U.S. in early 2014 used MLPE technologies.

*Unfortunately, in the Dominican Republic we are almost all exclusively using string inverters despite their drawbacks as the business owners here tend to look at short term costs vs long term benefits. Microinverters are a far better long term investment but so far, not readily available in this market.*

Key takeaways: String inverters, microinverters & power optimizers

- Inverters convert the DC electricity that your solar panels produce into appliance-friendly AC electricity.
- The three main inverter options available for homes residential and commercial solar installations are string inverters, microinverters and power optimizer systems.
- Microinverters and power optimizer systems are typically more expensive than string inverters.
- Microinverters and power optimizers are best for installations where one or more panels may be shaded, or where panels are facing different directions.
- Microinverters and power optimizers allow you to monitor the power production of each individual panel.
- A system that uses microinverters or power optimizers will produce slightly more power than a similar system with a string inverter.

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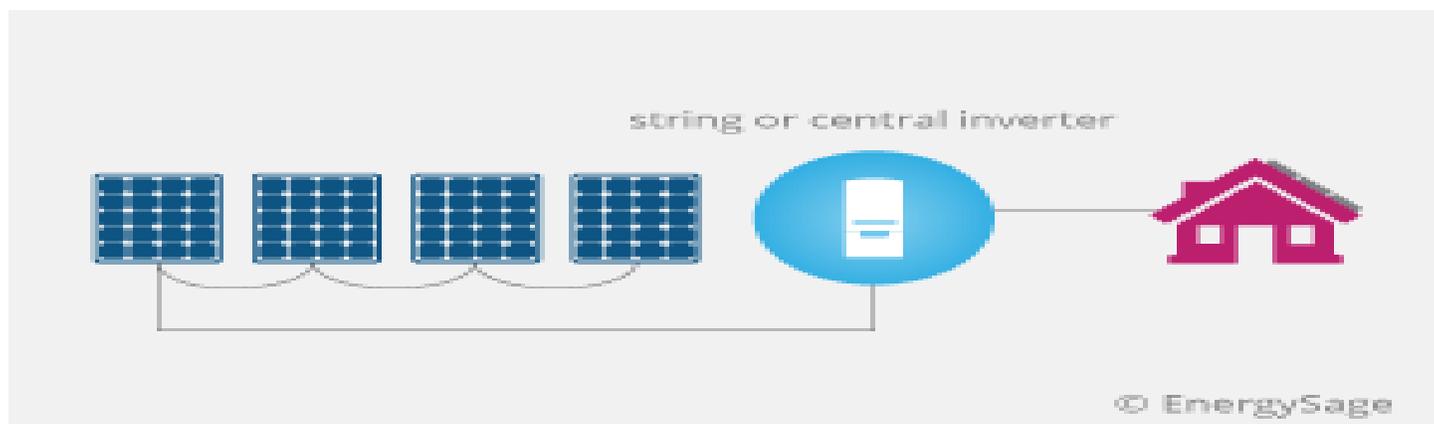
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## String inverters



String inverters are the most up front cost-effective inverter option available in the U.S. Solar installation companies will generally offer you a system with a string inverter if your roof is not shaded at any point during the day and does not face in multiple directions (such as a gabled roof). Never install string inverters on a roof where panels face multiple directions.

### How String Inverters Work

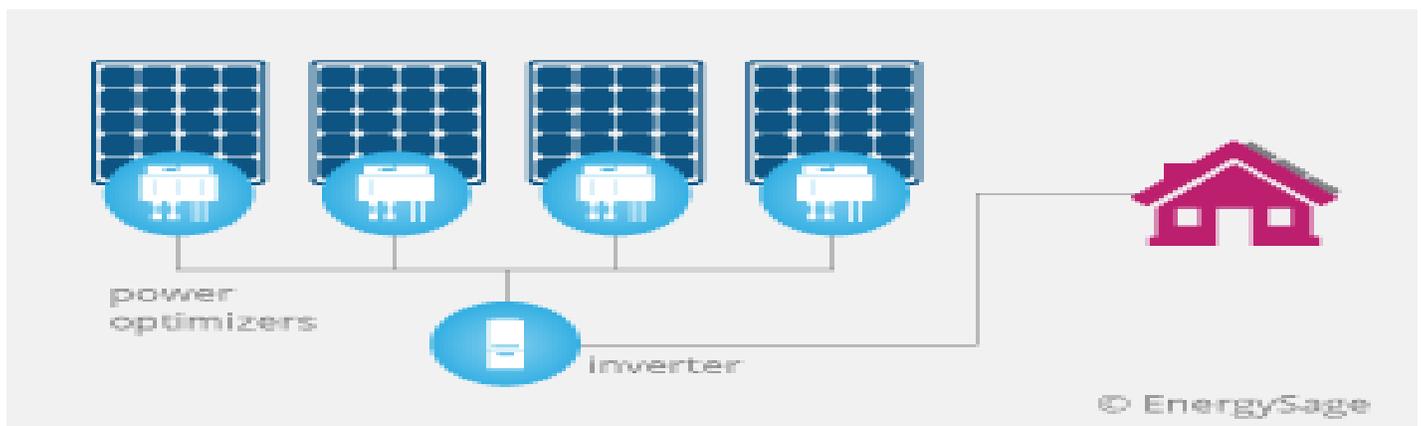
Your solar panels are arranged into groups connected by “strings.” Each string of panels is connected to a single inverter, which transforms the DC electricity produced by the panels into appliance-friendly AC electricity.

String inverter technology has been used for decades. It is a tried-and-true technology, but is not suitable for certain types of installations. **A string of solar panels will only produce as much electricity as its least productive panel – if one or more of your solar panels is shaded during any part of the day, the power output from that entire string would be reduced to its level.** For this reason, if your solar panels are installed facing different directions, a string inverter may not be a good choice. If there is shading from nearby buildings or trees, this must be taken into account.

One of the most common reasons for a panel to produce less power or stop producing power altogether is shading from nearby objects. If your roof is prone to shading any time during the day or in certain seasons, you could either remove the source of the shade or install the panels where they will not be shaded.

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## Power optimizers



Power optimizers offer many of the same benefits as microinverters, but tend to be slightly less expensive. Power optimizers are often considered a compromise between more expensive micro-inverters and the standard string inverter.

### How Power Optimizers Work

Like microinverters, power optimizers are located at each panel, usually integrated into the panels themselves. However, instead of converting the DC electricity to AC electricity at the panel site, they “condition” the DC electricity and send it to a string inverter. **This approach results in higher system efficiency than a string inverter alone.**

Similar to microinverters, **power optimizers reduce the impact of panel shading** on system performance, and also offer panel performance monitoring. Systems that use optimizers are typically more affordable than those that use microinverters.

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## Microinverters (not normally available in the DR)



Microinverters are rapidly gaining popularity, particularly for residential solar systems. Microinverters tend to be more expensive than string inverters or power optimizers, but their costs are falling as they become more popular.

### How Microinverters Work

Microinverters are installed on each individual panel in a solar energy system. They convert the DC electricity from your solar panels into AC electricity on your roof, with no need for a separate central inverter. In many cases the microinverters are integrated into the solar panel itself, but they may also be mounted next to the panel on the mounting system.

One of the major advantages of microinverters is that they cancel out the negative impacts of partial or complete shading. Because the DC-AC electricity conversion takes place at each panel, there is no "bottleneck" when one panel's production decreases. Microinverters also allow you to monitor the performance of individual solar panels.

### Comparing micro-inverter and power optimizer manufacturers

While the MLPE industry is growing rapidly, a few companies dominate the market. Below, EnergySage has evaluated each of the leading micro-inverter and power optimizer manufacturers supplying the U.S. market

#### Micro-inverter Manufacturers

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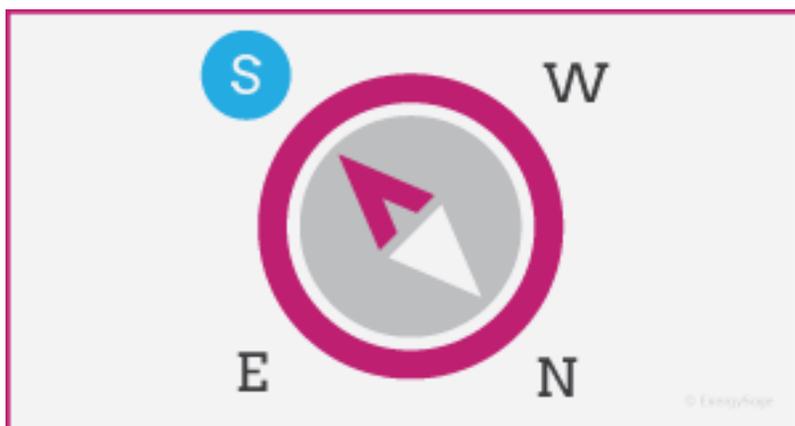
Micro-inverters perform the same function that a centralized string inverter does: They convert the DC electricity from your solar panels into appliance-friendly AC electricity.

However, unlike string inverters, solar energy systems **with micro-inverters will have an inverter installed for every panel**, so the panels operate independently of one another.

### Power optimizer manufacturers

Solar panel systems that use power optimizers also have one device installed per panel. The power optimizer “conditions” the power from each panel individually to maximize overall system performance. However, systems that use power optimizers still require a central inverter to convert the DC electricity into AC.

### Impact of roof orientation on solar savings, install them incorrectly and you lose money !



The direction that your roof faces, also referred to as the Azimuth angle, is the primary factor determining how much sunshine your solar panels will see over the course of the day. Solar panels are most effective when installed on south-facing roofs.

An easy way to determine the direction that your roof faces is to use [Google Maps](#). Look up your property and use the grid to find true south, then compare your roof.

Even if your solar panels don't face directly south, they can still produce plenty of electricity, regardless of whether you live in Minnesota or California. You also can mount solar panels on roofs that face east or west, (with far less output) on the roof of another building (like a barn or garage), or on the ground.

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### Why orientation matters with rooftop solar

**In general, solar panels that are oriented directly east or directly west will produce about 20 percent less electricity** than if they were facing south. Even with this decrease in performance, solar panels will produce enough electricity to save you hundreds of dollars a year. You can also improve your solar panels’ performance by adjusting the tilt of your panels downward. If you change the tilt from 30 degrees to 15 degrees, your production then will be only 15 percent lower than if your panels were installed in peak conditions.

EEN has visited installations where the Owner was not happy with his systems performance. In several cases the panels were installed at wrong angle or not facing the south.

**A 15 degree tilt in the Dominican Republic increases the wind load stresses on the panels which may result in catastrophic failure of the panels in high winds j!**

### How to choose the best battery for a solar energy system



If you want to go “off grid” there are certain specifications you should use when evaluating your solar battery options, such as how long the solar battery will last or how much power it can provide.

**As you consider your solar-plus-storage options, you’ll come across a lot of complicated product specifications.** The most important ones to use during your evaluation are the battery’s capacity & power ratings, depth of discharge (DoD), round-trip efficiency, warranty, and manufacturer. Obviously the costs of battery storage is far higher than the standard bi directional solar installation, roughly double.

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## Capacity & power

Capacity is the total amount of electricity that a solar battery can store, measured in kilowatt-hours (kWh). Most home solar batteries are designed to be “stackable,” which means that you can include multiple batteries with your solar-plus-storage system to get extra capacity.

While capacity tells you how big your battery is, it doesn’t tell you how much electricity a battery can provide at a given moment. To get the full picture, you also need to consider the battery’s power rating. In the context of solar batteries, a power rating is the amount of electricity that a battery can deliver at one time. It is measured in kilowatts (kW).

A battery with a high capacity and a low power rating would deliver a low amount of electricity (enough to run a few crucial appliances) for a long time. A battery with low capacity and a high power rating could run your entire home, but only for a few hours.

## Depth of discharge (DoD)

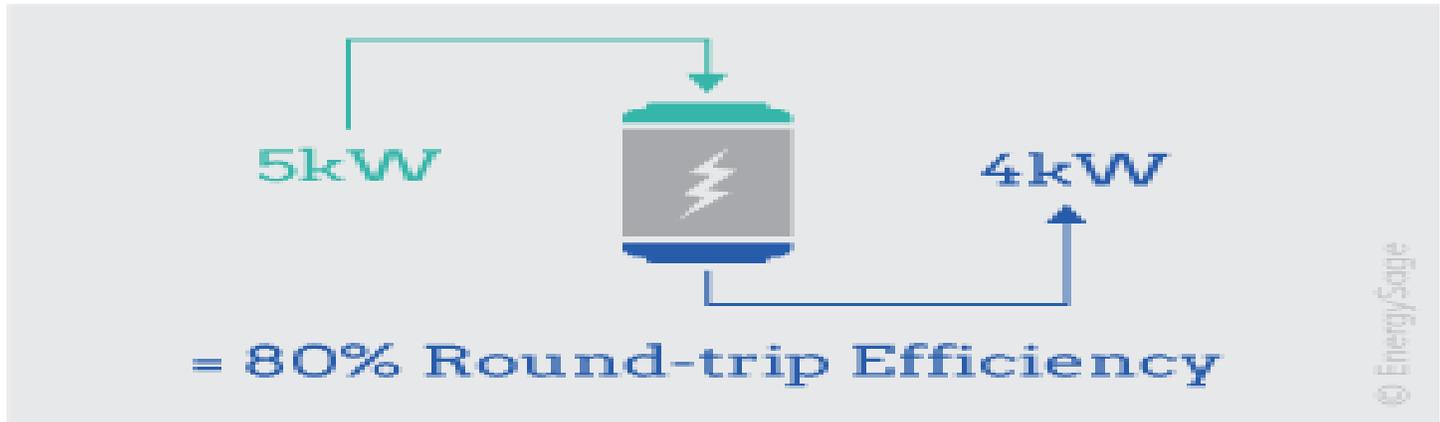


Most solar batteries need to retain some charge at all times due to their chemical composition. If you use 100 percent of a battery’s charge, its useful life will be significantly shortened.

The depth of discharge (DoD) of a battery refers to the amount of a battery’s capacity that has been used. Most manufacturers will specify a maximum DoD for optimal performance. For example, if a 10 kWh battery has a DoD of 90 percent, you shouldn’t use more than 9 kWh of the battery before recharging it. Generally speaking, a higher DoD means you will be able to utilize more of your battery’s capacity.

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## Round-trip efficiency



A battery's round-trip efficiency represents the amount of energy that can be used as a percentage of the amount of energy that it took to store it. For example, if you feed five kWh of electricity into your battery and can only get four kWh of useful electricity back, the battery has 80 percent round-trip efficiency ( $4 \text{ kWh} / 5 \text{ kWh} = 80\%$ ). Generally speaking, a higher round-trip efficiency means you will get more economic value out of your battery.

## Battery life & warranty

For most uses of home energy storage, your battery will "cycle" (charge and drain) daily. The battery's ability to hold a charge will gradually decrease the more you use it. In this way, solar batteries are like the battery in your cell phone – you charge your phone each night to use it during the day, and as your phone gets older you'll start to notice that the battery isn't holding as much of a charge as it did when it was new.

Your solar battery will have a warranty that guarantees a certain number of cycles and/or years of useful life. Because battery performance naturally degrades over time, most manufacturers will also guarantee that the battery keeps a certain amount of its capacity over the course of the warranty. Therefore, the simple answer to the question "how long will my solar battery last?" is that it depends on the brand of battery you buy and how much capacity it will lose over time.

For example, a battery might be warranted for 5,000 cycles or 10 years at 70 percent of its original capacity. This means that at the end of the warranty, the battery will have lost no more than 30 percent of its original ability to store energy.

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## Manufacturer

Many different types of organizations are developing and manufacturing solar battery products, from automotive companies to tech startups. While a major automotive company entering the energy storage market likely has a longer history of product manufacturing, they may not offer the most revolutionary technology. By contrast, a tech startup might have a brand-new high-performing technology, but less of a track record to prove the battery's long-term functionality.

Whether you choose a battery manufactured by a cutting-edge startup or a manufacturer with a long history depends on your priorities. Evaluating the warranties associated with each product can give you

### How long do solar batteries last?

There are two ways to answer this question and the first is to determine how long a solar battery can power your home. In many cases, a fully charged battery can run your home overnight when your solar panels are not producing energy. To make a more exact calculation, you'll need to know a few variables, including how much energy your household consumes in a given day, what the capacity and power rating is for your solar battery and whether or not you are connected to the electric grid.

For the sake of a simple example, we'll determine the size of a battery needed to provide an adequate solar plus storage solution with national average data from the U.S. Energy Information Administration. The average U.S. household will use roughly 30 kilowatt-hours (kWh) of energy per day and a typical solar battery can deliver some 10 kWh of capacity. Thus a very simple answer would be, if you purchased three solar batteries, you could run your home for an entire day with nothing but battery support.

In reality, the answer is more complicated than that. You will also be generating power with your solar panel system during the day which will offer strong power for some 6-7 hours of the day during peak sunlight hours. On the other end, most batteries cannot run at maximum capacity and generally peak at a 90% DoD (as explained above). As a result, your 10 kWh battery likely has a useful capacity of 9 kWh.

Ultimately, if you are pairing your battery with a solar PV array, one or two batteries can provide sufficient power during nighttime when your panels are not producing. However, without a renewable energy solution, you may need 3 batteries or more to power your entire home for 24 hours. Additionally, if you are installing home energy storage in order to disconnect from the electric grid, you should install a few days' worth of backup power to account for days where you might have cloudy weather.

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## Solar battery lifespan

**The general range for a solar battery's useful lifespan is between 5 and 15 years.** If you install a solar battery today, you will likely need to replace it at least once to match the 25 to 30 year lifespan of your PV system. However, just as the lifespan of solar panels has increased significantly in the past decade, it is expected that solar batteries will follow suit as the market for energy storage solutions grows.

Proper maintenance can also have a significant effect on your solar battery's lifespan. Solar batteries are significantly impacted by temperature, so protecting your battery from freezing or sweltering temperatures can increase its useful life. When a PV battery drops below 30° F, it will require more voltage to reach maximum charge; when that same battery rises above the 90° F threshold, it will become overheated and require a reduction in charge. Quality maintenance efforts can definitely impact how long your solar battery will last. For this reason it is important to contract EEN for the long term maintenance of your solar plant.

## What are the best batteries for solar?

Batteries used in home energy storage typically are made with one of three chemical compositions: lead acid, lithium ion, and saltwater. In most cases, **lithium ion batteries** are expensive but are the best option for a solar panel system, though other battery types can be more affordable.

### 1. Lead acid

Lead acid batteries are a tested technology that has been used in off-grid energy systems for decades. While they have a relatively short life and lower DoD than other battery types, they are also one of the least expensive options currently on the market in the home energy storage sector. For owners who want to go off the grid and need to install lots of energy storage, lead acid can be a good option. Good up to 250 kw

### 2. Lithium ion

The majority of new home energy storage technologies use some form of lithium ion chemical composition. Lithium ion batteries are lighter and more compact than lead acid batteries.

They also have a higher DoD and longer lifespan when compared to lead acid batteries. However, lithium ion batteries are much more expensive than their lead acid counterparts. Good for all systems

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### 3. Saltwater

A newcomer in the home energy storage industry is the saltwater battery. Unlike other home energy storage options, saltwater batteries don't contain heavy metals, relying instead on saltwater electrolytes. While batteries that use heavy metals, including lead acid and lithium ion batteries, need to be disposed of with special processes, a saltwater battery can be easily recycled. However, as a new technology, saltwater batteries are relatively untested, and the one company that makes solar batteries for home/commercial use (Aquion) filed for bankruptcy in 2017. Coming soon.....

Battery	Cost	Lifespan	Depth of Discharge
Lead Acid			
Lithium			
Saltwater			

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### Gel Batteries

Another type of sealed lead-acid batteries is the GEL Battery. These batteries specialize in deep-cycle applications and use fumed silica to form the thickening agent for the electrolyte. The fumed silica helps to make the cells sturdier.

Some other advantages of Gel batteries include that they durable, requires no maintenance, and they have high resistance to vibrations and shock. The cells also work well in both hot and cold temperatures and have great life-cycles. Also, with the viscous electrolyte, the cells become less prone to leakage in case of damage.

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Nonetheless, GEL batteries have more disadvantages than the other types of batteries, making them less popular. These batteries are ventless and they self-discharge a bit faster than the flooded cells.

Other common disadvantages of this category of batteries include their narrow charging profiles, and they are easily damaged if charging is not done right.

The batteries also lack ample amp-hour capacity, and their low charging voltage can make them disposed to accidental overcharge.

Especially with solar power systems, the electricity generation is a bit variable and can cause this overcharging. **In addition to the numerous drawbacks, Gel batteries are also more expensive than the flooded lead-acid batteries.**

### Usable Storage Capacity (kWh)

The energy stored in a solar battery system that can actually be used. In most cases this is less than the nominal storage capacity figure provided.

For example, the Enphase AC battery has a total storage capacity of 1.2kWh. But as only 95% of that stored energy can be discharged (aka a 95% Depth Of Discharge) they battery's usable capacity is really 1.1kWh.

### Battery Power (kW)

A solar battery's power is how fast it can be charged or discharged.

For example, an Enphase AC battery is a low power battery system (also known as an 'energy' battery) because it takes 4 hours and 23 minutes to discharge all its usable energy, while the BMZ ESS is a high power battery because it can discharge all its usable energy in under 40 minutes.

A high power home battery system isn't necessarily more desirable than a low power battery – your household's unique energy usage needs will determine how much power you will require from a solar battery and the best energy storage solution for you.

### All In One Unit

This means the system includes batteries, a battery management system (BMS) and an inverter. The Sunverge SIS is one example of an all-in-one energy storage system.

If a battery management system and/or inverter have to be purchased separately, this will add to the total cost of the system. Don't buy a solar battery system until you have read the latest version of its warranty document sourced direct from the supplier. They change often.

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If you only discharge the battery once per day (most likely for larger solar batteries in residential situations) then the warranty period may expire well before the warranted kWh are all used up.

The number of kilowatt-hours (kWh) a home battery system can discharge per day is multiplied by the number of days in the warranty period in order to generate the figures for this row.

### Cost Per Warranted kWh (1 Cycle Per Day)

This is the solar battery price (excluding installation) divided by 'Warranted kWh (1 cycle per day)'. If you discharge the battery approximately once per day, this number indicates what energy storage system may be the most cost effective in your circumstances.

### Cost of battery storage

Generally speaking, adding battery storage will double the cost of your solar installation.

### A Note on Battery Warranties

Some solar batteries in the table have different warranties for components within the unit. For example, some "all in one" battery storage systems warrant the batteries for 10 years but the internal inverter only has a warranty of 5 years.

### Solar DC cables DO NOT BUY NORMAL ELECTRICAL CABLES !

The normal dc cables are made with PVC insulation. whereas the solar cables are made with XLPE insulation. the normal dc cable life is five to eight years. whereas the solar cable life is min 25 years guaranteed. as the life of the cable increases the insulation loses the property and efficiency go down whereas in solar cable the max efficiency is down only by 10% after 25 years of service.

There are plenty we can keep telling you, do not believe if a person says cable is a cable. **BE VERY CAREFULL it does you no good to buy 25 year life solar panels and couple them with cables that last only eight years !**

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## Solar operations and maintenance (O&M) packages



Solar operations and maintenance (O&M) packages are protection plans for your solar investment. You can think of them as a sort of “owner’s insurance” for your solar panels. If a tree falls on a portion of your house, home insurance plan will likely cover a large portion of the repair costs. The same is true of solar O&M plans.

If your solar system is underperforming, whether as the result of environmental, equipment, or other reasons, your O&M provider can perform physical repairs to your panels, inverters, or whichever portion of your array is affected. Solar operations and maintenance plans will also cover regular checks on your system to confirm that it is operating at peak performance. Regular thermographic surveys identify hot spots that can cause fires.

## Benefits of solar operations and maintenance packages

A strong solar operations and maintenance service package provides many benefits to residential customers. When you’re comparing your options, consider whether the following services are covered:



*Monitoring and Site visits.* O&M plans should include remote monitoring and regular visits throughout the year for your provider to come and physically inspect your solar system. From these site visits, your O&M provider will be able to diagnose problems with your system and take action to bring your electricity production back to normal.

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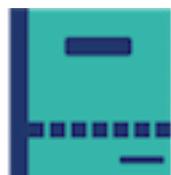
*Pest control.* A common threat to solar systems is pests. Birds and rodents may nest in and around your array, leading to the potential for fires or electrical damage. Critter guards can help to alleviate this issue, but O&M companies often include pest control in their plan to counteract this common solar issue. Rats eat cables.



*Cleaning.* Well-designed solar panel systems rarely need cleaning. However, if you live in an area with high amounts of particulates and dust floating around, your O&M provider should if they find them losing efficiency due to dust or any other material dirtying your panels.



*Electrical systems checks.* Damage to the electrical systems connecting your solar array to your home and the grid need to be maintained as well. O&M plans should cover checks to all of your wiring and electrical systems that make sure the energy you produce is being transported and used correctly.



*Solar inverter maintenance.* Solar inverters (particularly string inverters) have a shorter lifespan than solar panels themselves, and need to be monitored closely for degradation. A good solar O&M plan will pay extra attention to your solar inverters to ensure your panels will be able to convert produced energy to usable electricity.

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*Hiring solar crew and personnel.* In order to complete maintenance projects on your solar array, specialists and panel experts need to work with your system. A good solar O&M plan will find reputable repair crews to keep your panels maintained.

## Importance of a solar service package

If your installer is available and you are still covered by their labor warranty, it is always best to first consult them for system maintenance – they know your system and equipment, and have a preexisting relationship with you. **Even so, there are a few reasons why you may want to consider a separate O&M package.**

Solar installers make their money from an initial installation. As a result, their priority may be focused on working with new customers, whereas a service package prioritizes your already-installed system. For the same reason, solar installers often send their best talent to work on new installations, rather than fix your damaged solar panels or inverters.

In some cases, your local solar installer may have gone out of business, meaning any installations they performed and were still under warranty no longer have a company to service them. Without a solar O&M plan, if your installer goes out of business you may not have an easy way to diagnose and fix issues with your solar array.

**EEN has found that many installers offer “O&M service” in the price of the offer. However when talking to buyers of these “services” many of them have said they service is poor to non existent. Again everything has a cost, if you are told its free, it’s probably not worth it’**

## Commercial vs. residential O&M plans

Commercial and residential solar panel systems vary in size and in the specifics of the installation. As a result, the logistics behind your O&M plan depend on whether your system is a small-scale rooftop system or large commercial project.

Plans for larger commercial projects tend to focus more on preventative strategies, while rooftop installations are typically more “reactive.” This is due in part to commercial properties being able to handle regular truck visits from solar maintenance crews. Additionally, residential systems are typically much smaller, and in the event of a problem, a small crew can be easily dispatched by an O&M company to repair that system. Conversely, an issue with a commercial system can take up more resources on the service company’s end.

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## Now you are ready to buy, what questions to ask a solar energy company ?



Once you have decided to go solar and made a determination about your equipment and financing options, the final step is choose a solar company to complete your installation. Going solar is a significant investment, and as with any other big purchase, it is important to work with someone that you can trust.

### Solar FAQ: What to ask when you receive a solar quote

The vast majority of solar installers should provide you with a quote for your solar energy installation before they conduct a site visit. Use your early conversations with them as an opportunity to ask questions that verify their business practices and experience level:



#### Equipment

- Are the panels mono or poly ?
- What is the degradation rate of the panels ?
- What are the rated wind loads ?
- Do you use 50 mm or 35 mm width solar panel frames ?

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- Are the panels over 20 % efficient ?
- What is the minimum guaranteed output per panel ?
- What are the typical flash test results of the panels ?
- Are the panels Type A and are the new ?
- What wind loads will the mounting frames accept ?
- What is the material of the mounting brackets ?
- Are the cable solar rated ?
- Is the electrical equipment UL listed ? USA standards
- Are the inverters listed in the top 5 world wide ? <https://www.cleanenergyreviews.info/blog/best-grid-connect-solar-inverters-sma-fronius-solaredge-abb>
- What warranty do the inverters have ? (hint less than 10 years is a warning sign)
- Do you stock spare panels and inverters for emergencies ?



### Licenses performance and insurance

All solar installers in Solar Marketplace should have the necessary credentials and insurance policies where they operate.

- Do they have all of the necessary business license and insurance policies for your state and locality?
- What is their license number? (Use it to verify their credentials.)
- Do they design and install the systems themselves, or do they subcontract to local companies? If they do use subcontractors, are the subcontractors licensed?
- Do they use a qualified system to estimate solar performance ? <https://www.helioscope.com/>
- Will there be a master electrician on-site when the system is installed?
- Who is the insurance company and what does it cover for personnel and equipment ?
- Are the workers trained to work at heights ?
- Do they have a safety specialist and regular training ?

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## Installer experience and expertise

Ask the following questions to get an idea of an installer's experience level.

- How long have they been in business? <https://www.energyexpertsnow.com>
- Do they operate in multiple states, or are they a local company?
- Do they have an international partner for warranties and technical expertise ?
- How many solar energy systems have they installed? <https://www.meeco.net/products/storage-management>
- Can they provide you with customer reviews, references and examples of their other installations? Do they have references with clients who have had post-installation service calls?
- How much experience do they have working with your utility company?
- Do they have bank references as a solar installer ? e.g banks will finance their installations ?
- 



## Warranties and replacement/repair procedures

While most solar energy systems will require very little maintenance and will operate without many problems for their 25- to 35-year lifespan, you should be familiar with your installer's replacement or repair procedures in the unlikely event that something does go wrong.

- Who should you contact if there is a problem with the system? Where are they located? Who is responsible for ensuring that warranties are serviced in a timely manner?
- How many different warranties are there total for the system's components, and do they cover shipping and labor costs in the event that a component needs to be replaced?
- Are there spare panels and inverters in the country ?
- Will they repair or replace the inverters when needed ?
- Are they certified business partners with the panel and inverter suppliers ?

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- Does their warranty also cover your roof?
- If your roof needs repairs in the future, what is the process for removing and replacing the solar panels?
- What happens if the system does not produce as much power as was promised? Does the company offer a performance guarantee?



## What should I ask my solar company at the site visit?



### During the site visit, your installer will:



**Take measurements of your roof**



**Conduct a shade analysis to verify that the quote they provided for you is accurate**



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**Answer any questions about the equipment that they recommend, and why they chose it for your property**

If you have any concerns about the condition of your roof, you can also confirm during the site visit that your installer will conduct a roof inspection prior to installation and let you know whether any work needs to be done.

Reputable installers recognize that going solar is a big decision and should not pressure you to sign a contract on the same day as your site visit – be wary of those that use high-pressure sales tactics. Use your site visit as an opportunity to seek clarifications from your installer in-person, answer any outstanding questions regarding your quote, and confirm that the company is one you are comfortable doing business with

**Tax benefits in the DR for solar energy**

The Dominican tax code allows you to deduct 40 % of the investment over three years. I.e 13.33 % per year of the 40 % for three years. This effectively reduces your cost of the solar system by 40 % thus improving your payback and ROI by 40 % as well.

**So now, what are you waiting for ? Every day you wait you are paying for energy that you could be generating practically for free after payback on initial investment . Go solar and go with Energy Experts Now / meeco +1 809 – 526 3030 sales @energyexpertsnow.com**



<https://energyexpertsnow.com/>

Much of the information above was obtained from the website www.energysage.com and we thank them for providing such valuable information to the solar community.

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