
1.What is a solar water heater?

A solar water heater uses the sun’s energy rather than electricity or gas to heat water, thus reducing your monthly utility bill. When installed properly, solar water heaters are more economical over the life of the system than heating water with electricity, dedicated heat pumps, heat recovery units or propane.

In Florida, three types of solar systems are used: pumped, integral collector storage (ICS), and thermo-siphon. The direct circulation system *(see Figure 1, page 2)* circulates potable water from the water storage tank through one or more collectors and back into the tank. The solar collector is the main component of the solar system. It is usually a metal box with insulation and a black absorber plate that collects solar radiation and heats the water. The circulating pump is regulated by either an electronic controller, a common appliance timer, or a photovoltaic (PV) panel.

In integral collector storage systems, the solar water storage system is built into the collector. The potable water in the collector unit is heated by the sun and delivered by city or well water pressure to an auxiliary tank (which

contains non-solar back-up heating) or directly to the point of use.
A thermosiphon solar water heating system has a tank mounted above the collector (normally on the roof) to provide a natural gravity flow of water. Hot water rises through piping in the collector, which is mounted below the tank; heavier cold water sinks to the lowest point in the system (the collector), displacing the lighter hot water which rises to the tank.
The ICS and thermosiphon systems are simple since they use no pumps or controllers and water always flows through the collector.

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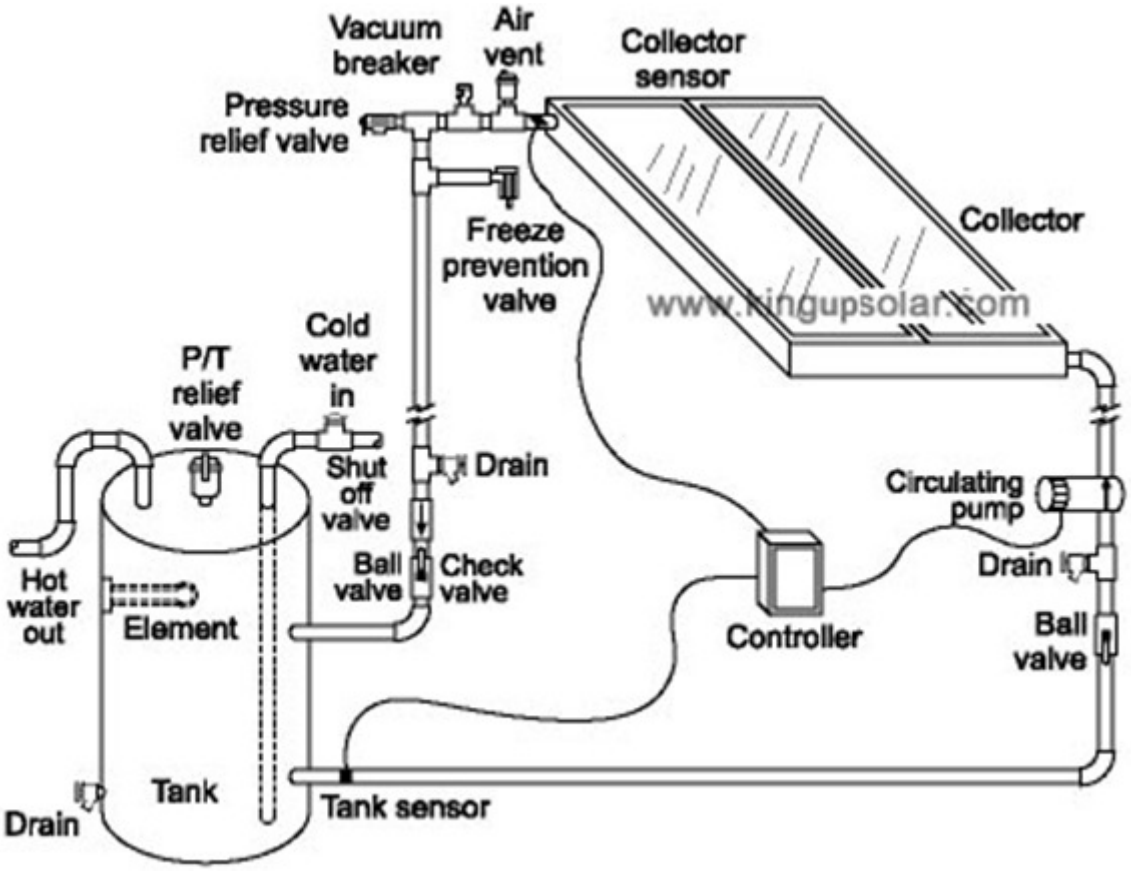
2. How does a direct circulation solar system work?

As sunshine strikes the collector, the water inside it is heated. If the circulating pump is regulated by a PV panel, the pump starts turning as the PV panel is activated by the same sunshine. This direct current (DC) motor pump moves water from the tank through the collector and back to the tank. As the sun's intensity changes throughout the day, the circulating pump also changes its speed accordingly. By the end of the day, the water in the tank has been circulated many times through the collector and has been heated to usable hot water temperatures. If the circulating pump is regulated by an electronic differential controller, a sensor at the outlet of the collector and a sensor at the bottom of the tank (Figure 1) activate the circulating pump when the water in the collector is about 15-200 F warmer than the water at the bottom of the tank. The pump then circulates water from the collector and the tank. This process continues as long as the water temperature at the collector outlet is about 50 F higher than that in the bottom of the tank. If the temperature difference decreases further, the controller automatically shuts off the pump. Common appliance timers also may control system operation. The timer is set to operate during a period of the day when solar radiation is available to heat the potable water. It is important that the timers used in these systems incorporate battery back-up in the event of power failures. In order to avoid loss of energy from the tank during overcast days, the collector feed and return lines are both connected at the bottom of the storage tank. During normal operation, natural stratification allows the warmer water to rise to the top part of the tank. During periods of insufficient sunshine or high hot water demand, a backup electrical element in the storage tank heats the water. The check valve prevents heat loss when the circulating pump is off. The circulating pump consumes only a small amount of electricity ?around $5 to $10 worth per year, or in the case of PV ?none.



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3. How much do I save?

Your monthly savings will depend on the amount of hot water you use, storage tank size and type and price of fuel used for backup water heating. For a family of four, the typical hot water usage is 70- gallons per day, thus using 3990-kilowatt-hours per year to heat the water electrically, or $399 per year worth of electricity at 10?per kilowatt hour.

A solar water heater should save between 50% and 85% of the hot water portion of the monthly utility bill, or $200 to $300 per year for a family of four, if the backup element is kept at 1220 F.

A solar water heater can save even more if you turn off the backup and rely solely on the sun for your hot water. During summer months, when hot water demands are lower and the sun shines longer, most solar owners turn off the backup element circuit breaker, or switch. As electricity and other fuel prices go up, solar savings will increase accordingly.

An FSEC fact sheet, *Solar Hot Water Energy and Cost Savings for Typical Florida Residential Installation*, provides an overview of the potential savings from various solar systems available in Florida.

Figure 1. A solar water heating system

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4. Do I have to change my habits to use a solar water heater?

No. Solar water heaters are always installed with a backup heating system in the storage tank to ensure that hot water is available at all times. However, to maximize solar utilization and your savings, you should attempt to use the most hot water in the late morning and early afternoon when the solar system is operating at its peak due to the available sunshine. Also, your solar system will be more effective if your use of hot water is spread more evenly over the week. For example, if you use hot water for laundry, instead of washing seven loads of clothes in a single day, wash one load each day. This will reduce the amount of backup energy required for your solar system.

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5. What kind of a solar collector should I buy?

There are basically two types of solar collectors available for solar water heating. The first is referred to as a flat-plate glazed solar collector. The second is the integral collector storage (ICS) collector *(Figure 2)*. Both collectors are mounted in a fixed position throughout the year and do not track the sun as do some collectors that are used primarily for high-temperature applications.

A basic flat-plate collector consists of a metal enclosure, an absorber plate and flow tubes, insulation, and a glass covering. Flat-plate collectors can be 2 to 4 feet wide, 5 to 12 feet long, and 4 inches thick. The absorber takes in the sun's energy, which is then transferred to the water flowing through the tubes attached to the absorber.

An ICS collector consists of large tubes, often 4 inches in diameter, in which potable water is both heated and stored in a combined heat storage and collection unit. As with the flat-plate collector, the ICS unit also consists of a metal enclosure, insulation, and a glass covering. ICS units are available in sizes ranging from 30 to 50 gallons, and can range from 4 feet in width to 8 feet in length to 10 inches in depth.

To reduce heat losses, all flat-plate and ICS collectors generally have insulation behind the absorber plate and a glass cover on the front, facing the sun. The best cover material is tempered glass of low iron content. Some edge insulation inside the enclosure box is also necessary.

The absorber plate is made of copper and is coated with a black chrome or nickel material called a selective surface. This surface greatly enhances the collector's ability to capture and retain solar energy. Some manufacturers also use black paint as an absorber coating.

The Florida Solar Energy Center conducts a state-mandated program of collector testing and certification. All collectors now sold in Florida should

bear the Center's certification label.
A document entitled *Thermal Performance Ratings*, available from the FSEC Public Information office, contains the performance rating for each solar collector certified by the Center. The document also provides an approximate efficiency-per-dollar comparison method you can use as a guide for rejecting inefficient or overly expensive collectors.
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6. Since there are several different types of solar water heating systems, how can I compare their performance?

FSEC conducts a state-mandated standards program for solar domestic hot water and solar swimming pool heating systems. The same solar collector can perform differently when installed in different system types. In addition, the other components (tank, pump, controller, etc.) selected for a particular system can have a large effect on the overall performance of a solar system. To allow comparison of complete systems, the "Florida Energy Factor" was devised to rate the performance of all solar system types. This factor is similar to the rating given to electric and gas water heaters.
The higher the energy factor, the more a solar water heater will save. The FSEC Public Information Office can supply energy factors for Florida solar systems, as can your solar vendor.

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7.Are solar tube collectors more efficient than flat plate collectors?

When comparing peak efficiency levels it may seem that there is little difference between flat plate and evacuated tubes, in fact flat plate may actually be higher, but this is during minimal heat loss conditions. When averaged over a year evacuated tube collector have a clear advantage. The key points are:

1). Due to the cylindrical shape of the evacuated tube, the solar tubes are able to passively track the sun throughout the day. Flat plate collector only provide peak energy output at midday when the sun is perpendicular to the collector's surface. To learn more about IAM and performance click here.

2). Air is evacuated from the solar tube to form a vacuum. This greatly reduces conductive and convective heat loss from the interior of the tube. As a result wind and cold temperatures have less effect on the efficiency of the evacuated tube collector.

3). Kingup solar collectors can often be used in subzero temperatures without the system sustaining damage.

Flat plate systems often require expensive and complicated "antifreeze" systems to be installed.

4). Evacuated tubes are strong, long lasting, and should one be broken, inexpensive and easy to replace. If a flat plate collector panel is damaged the whole panel must be replaced.

5). Due to the high efficiency absorption of solar radiation even during overcast conditions, combined with

excellent insulative properties of the solar tube, solar tube collectors can heat water all year round (backup from gas and electricity is still required).

6). Due to the various advantages of evacuated tube collector over flat plate collectors, a smaller collector can be used to provide the same heating performance. For example, a standard household of 4-5 people would usually require a 250-300L water storage tank. Depending on your location, only 30 evacuated tubes would be required to provide all summer hot water needs and a large percentage in other seasons.

7). Flat plate solar collectors can produce similar heat output to evacuated tube collectors, but generally only during hot, sunny conditions. When averaged over an entire year, evacuated tube collector heat output pernet m2 of absorber area, is between 25% to 40% greater that a flat plate collector.

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8.Which collector is the best value for money?

Rather than looking at just peak efficiency levels when comparing solar collectors, cost per unit of energy produced is much more logical. For example: Although collector A may be 20% more efficient than collector B, if collector A is 30% more expensive, then in fact collector B may be a better choice, as per kWh of energy produced per day it is cheaper. When payback time is of concern, not only price per kWh of the product is important, but also of the end system. In this regard Kingup solar collectors provides a further vantage as Kingup solar collectors are very easy to install, and that can make a huge difference in terms of total install costs. For more information comparing collector performance please click here.

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9. What is the proper orientation of the solar collector?

Collectors should be mounted on an unshaded area of a south-facing roof. They can face up to 45 degrees east or west of south without a significant decrease in performance.

For all shingle and tile roofs in Florida that generally have pitches greater than 3 in 12 (i.e., 14 degrees), collectors should be mounted parallel to the roof. Collectors mounted in this manner are more aesthetically pleasing. However, for flat or very low-sloping roofs, collectors should be tilted at an angle (to the horizontal) that is approximately equal in degrees to the local latitude. Florida latitudes range between 25 degrees (in the Florida Keys) to 31 degrees (northern border). Since the sun is lower on the horizon during the winter months, tilting the collector at an angle up to 15 degrees greater than latitude will increase winter performance, which is desirable in most cases.

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10. Are the solar collectors noticeable on the roof?

Today solar collectors are typically integrated into the slope of the roof. This method of installation gives the solar collector the appearance of a quality, opaque, glass skylight. In most cases, since the piping is not seen, it actually improves the appearance of the home because it looks like an elegant, expensive skylight. Kingup offers a free solar site survey to determine the location of the solar collector, and to verify that you will not have any collector shading problems. You typically need only about 4 hours of direct sun (between 9am to 4pm) per day.

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11. How do I protect my solar system during subzero temperatures?

If you have a system that is operating in areas with subzero temperatures then freeze protection must be implemented. The easiest means of preventing freezing is to use a controller with a low temperatures setting, so when the manifold temperature drops below a certain pre-set temperature (50C/400F), the pump will circulate, warming the collector with water from the bottom of the storage tank. The pump will not run continually, just periodically, the frequency of which will depend on the outside temperature. In extremely cold areas, a closed loop using a glycol/water mix may be appropriate.

Another method of freeze protection is achieved by water recirculation. When the temperature drops below 400 F, a collector freeze sensor

activates the pump to circulate warm water through the collectors. A second level of protection in this system, in the event of power failures, is provided by drain valves that manually drain the collector. Manual protection alone may be adequate for conscientious homeowners in southern Florida areas where hard freezes are rare. It is best to review the manual draindown instructions provided on the freeze information label or call your installer prior to manually draining your system.

ICS systems incorporate thermal mass freeze protection. The large size of the tanks in the ICS units requires a much longer and more severe period of freeze temperatures before all the water in the tubes freezes. Florida freezes are generally not severe enough to turn all the water in ICS tanks into ice. Nevertheless, piping on the roof and in attics must also be protected. ICS systems in central and north Florida also incorporate a freeze prevention valve as a secondary freeze protection mechanism.

In north Florida, an indirect system is often used *(Figure 2).* An antifreeze solution, similar to that used in automobiles, is circulated through the collector. A heat exchanger between the collector and storage tank transfers heat from the antifreeze to the potable water. Although this system is usually more expensive and less efficient than direct systems (in which the water used for bathing, etc., is the same water circulated through the collectors), it provides better automatic freeze protection in colder climates. In some cases, thermosiphon systems also incorporate a heat exchanger in their design, which makes the thermosiphon design quite suitable for colder climates.

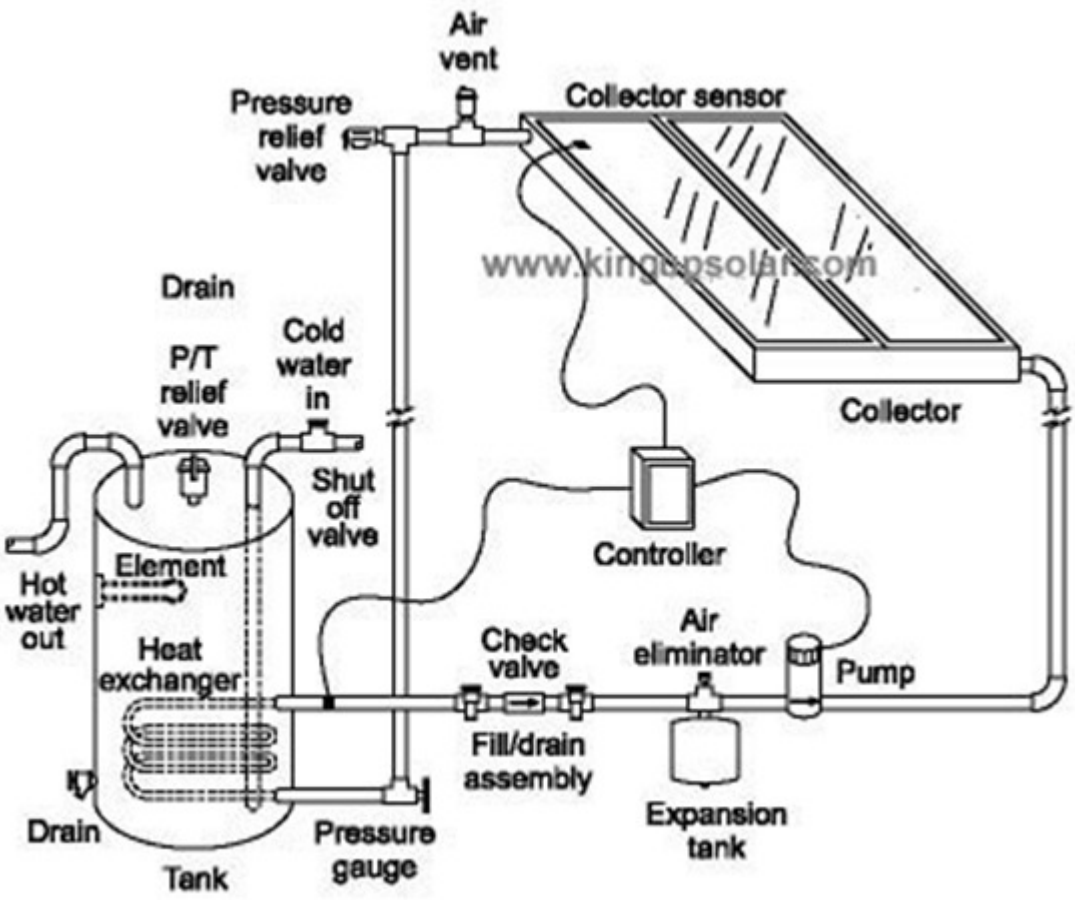

Figure 2. Indirect pumped system using antifreeze solution

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12. Can Kingup solar collectors be used in cold conditions?

Yes.Kingup collectors can be used in temperatures as low as -300 C, although performance is greatly reduced in such extreme conditions. Good heat output is still achieved in mild sub-zero conditions.

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13. Will water be heated on a cloudy day?

Yes. Although the heat output of the solar collector is reduced on overcast days it will still be able to provide heating. If it is a heavily clouded day or raining, then more gas or electric boosting may be required to maintain water at the required temperature. This system will be automated so you don’t have to worry about running out of hot water on a rainy day.

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14. What other ways are there to save on water heating bills?

Besides simply using less hot water, and timing solar-heated water use to peak when the solar exposure is at its peak, the following strategies are suggested:

Finally, in a one-tank solar system, it's a good idea to have the back-up element controlled by a timer or manual on/off switch to keep it from coming on during the day. This strategy allows the solar system to produce all the hot water without the back-up heater being activated.
Timers may become very attractive if peak-load pricing of electricity is introduced. In that event, electricity would be priced at a much lower rate during certain hours of the day than at other times. Peak-load pricing is being evaluated by many electric power companies.

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15. Is Solar Hot Water a good investment for me?

The potential savings on water heating bills are affected the most by the type of fuel you are using to heat that water and the number of people in the home. If you are heating hot water for two or more people and you heat water with electricity or with bottled or natural gas, then you owe it to yourself to look at solar water heating, it could be a great investment for you.

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16. Are solar water heating systems reliable?

Properly designed and installed systems with glass-covered collectors should perform well for more than 20 years. Controllers, like other electronic devices, may require servicing during the life of the system, and the pump and hot water tank may have to be replaced after 10 years. Since conventional water heaters have the same expected lifetime, water tank replacement costs are not regarded as unique to solar energy systems.
Normal maintenance consists of checking pipe insulation, roof penetrations and collector mounting, pump operation and tank flushing. The latter is also recommended for conventional water heating systems, as is periodic replacement of the water heater sacrificial anode rod.
Many installation firms provide yearly maintenance check-ups of their solar systems similar to annual air-conditioning system maintenance programs. These can be beneficial in extending the life of the system and ensuring optimum performance.
It is important to request that the installer put an indicator on your solar system showing that the system is working. It can be as simple as a small light that comes on when the system is operating.

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17.Will the Kingup solar collector be a fire hazard during hot, dry weather?

No. The Kingup solar collector's components are all high temperature rated and non-flammable so even during strong sunlight with the circulation pump turned off (stagnation), the system will not catch alight or give off any sparks. The majority of the solar collector's components are stainless steel, aluminium, glass or glass wool. The manifold outlet should be fitted with a temperature relief valve, which will prevent the manifold temperature from exceeding 990C / 2120F.

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18. What is the "payback" on a solar hot water system?

The term "payback" is a misconception that shows a false value towards an income generating device. Electric and gas water heaters do not have a payback! When you purchase a more efficient refrigerator, the decision to buy comes not from how long the savings generated will pay you back for your initial investment, but it comes from getting better service for a lower operating cost with a better rate of return. Solar water heating systems do just that. They provide quality hot water at a lower cost than heating with electricity or LP gas with more equity value in your home.

Solar collectors are typically designed to last as long as your home with little or no maintenance. These systems often give a 14% to 20% per year non-taxable rate of return on your money - even for a two person household. It is important to remember that hot water is a constant daily expense; other large household appliances, like air conditioners and heaters, are seasonal expenses.

Hot water is typically 20% to 30% of the annual utility bill. Hot water for showers, dishwashing, and laundry costs about $110 a year per person (when LP gas costs $1.15/gallon or electricity costs 7 cents/kilowatt hour). When electricity is 10 cents/kWh or LP gas is $1.60 a gallon, it will cost about $646 a year to heat water for a four person household. A properly sized solar water heating system can be expected to save this household $450 to $600. And Kingeagle Solar has several passive and active solar hot water systems to accommodate households from two to ten people, all of which qualify as a non-taxable investment.

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19. What about this investment in a solar hot water system?

It is ironic that you, if you are an individual using LP gas or electricity to heat water, will pay for a solar hot water system over the next 4 to 8 years whether you get one or not!! You can invest today in a solar hot water heating system and have monthly savings and increased equity value in your home, or you can pay the local utility company every month. Your

solar system savings will offset your payments, so you will actually own your solar water heating system at the end of five years. Remember that all solar savings are in non-taxable income, so a dollar saved on your water heating expense is equivalent to $1.30 or more of your taxable income.

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20. What is the guranttee for the distributor?

With confidence of our quality and our quality control, we give our guarantee for 5 years of our products sold to oversea and relative guarantee for the accessories with limited liability:

1. Guaranteed subjectMain solar water heater products has 5 years guarantee for followings:

· storage tanks
· solar tubes
· frame
· reflect panel
· other parts approved by us
· All accessories has its own relative guarantee, it is not including this guarantee

2.limited liability

We are responsible for the above parts of our solar water heater for 5 years and if there are any problem, users can call our nearest distributors for exchange or repair or refund. But our responsibility are not applying for following conditions:

· bad weather: like heavy hail (dia. Of hail over 25mm), storm. For such weather, it is out of our control and user should cover like other treasure insurance.
· Improper installation and wrong operation of user: solar water heater are an professional products and should be installed by our distributor or these technical people approved by us. If by improper installation, user can not get proper result of solar water heater can caused damage.
· Bad water quality + improper maintenance: If the water quality too bad, there will be too much water dirt accumulating inside the solar tube and will affect the performance of the same. Therefore, we require the user to give proper maintenance according to our advice.
· For refund, it will be calculated on the value of the products purchased and by the invoice. It will be divided into 5, if the problem arise in third of the year, the user can get 2/5 of the purchased value, if it arise from second year, user can get 3/5 purchased value. If during the first of year, it will be 4/5. And the last year, 1/5.
· The third party damage

Transportation damage: after our shop deliver the product to users, the risk also transferred if there are any need of transportation.

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21.What about the environmental benefits of going solar?

Any time you use solar energy to offset the amount of fossil fuels that are burned, you contribute to everyone's health and welfare. Operating one solar water heater instead of an electric water heater saves the equivalent of nine barrels of oil every year and reduces carbon dioxide emissions (a greenhouse gas) by 1600 pounds and sulfur dioxide (contributes to acid rain) emissions by 12 pounds. Multiply those emissions per household by all the homes in your neighborhood, town, county, or state, and the benefits -- and the air and water -- become even more clear. Environmental Consciousness is a state that induces action through your belief in leaving a better world for yourself and future generations. We are all free to believe what we choose and what we each do, attests to what we believe.

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22.Let the Sun make your monthly payments!!

All banks and lending institutions will loan you money to put in a solar system. The good news is that even for two people the equity value and savings will result in a net positive income for the length of the loan and that equity value has been proven to last over 30 to 40 years. Then the system will generate $300-$600 in non-taxable income each year. Solar hot water systems usually cost $2,400 to $3,600 depending on the size and type of system you install. KINGEAGLE has a payment plan called "Let the sun make the payments," where we finance 1/2 the total cost of the system over 3 to 5 years at 6% interest. The money you save on your monthly utilities is actually being used to purchase your own water heating system.
Solar Energy...the Choice is yours!
The only choice is what you are going to be getting for your money - you will be incurring a monthly debt with no equity and higher payments with no savings or return, if you do not go solar.
The choice is not about spending money. The choice is only about what you actually "get" in return for a continuing monthly debt. You are spending money anyway - either you invest it for more home equity and savings, or you give it away for a service provided by your local utility.
For example, if you could either lease or buy a car, making equal payments for five years, which would you do? Pay to lease or pay to own!? Then you can start keeping utility profits for your own nest egg.
EVERY DAY THE SUN RISES. . . and every day you could be saving money

and enjoying the revitalizing power of sun heated water...

ELECTRIC/ GASWATER HEATING	vs	SOLAR HOTWATER HEATING
1. Pay 100% of your water heating bill.	vs	1. Eliminate 80 to 95% of your water heating bill.
2. Constantly rising yearly utility bills	vs	2. Constantly increasing savings in non-taxable income.
3. No equity or increased value in your home	vs	3. Your home equity value increases because of your investment.
4. Monthly payments for hot water with no return on your investment	vs	4. Income generator produces a monthly positive cash flow.
5. Creates air pollution and puts heavy toxic metals into our air and water.	vs	5. Uses non-polluting free solar energy.
6. Often runs out of hot water.	vs	6. Doubles the amount of hot water available.

BOTTOM LINE!

Money Spent	vs	**Money Earnedwith** built-up equity in your home and a non-taxable rate of return on your solar system of 15% to 20% per year. 423% return the first year on an Energy Star Home.