

# **SolarAttic, Inc.**

## **PCS1 COMMON QUESTIONS**

- **About the Company**
- **About Business Issues**
- **About the Product**
- **About Technical Issues**
- **About Sales Issues**

Copyright 1990-2000  
**SolarAttic, Inc.**  
All Rights Reserved

Rev 11/29/2000

## About The Company

### **1. Who is SolarAttic, Inc.?**

SolarAttic, Inc. is a Minnesota Corporation engaged in the research, development, and manufacturing of products that use attics as energy vehicles. The company's first product heats swimming pools using attic heat derived from solar radiation. The company's second product provides supplementary space heating. The company's other product lines, which are under development, are an attic based solar domestic hot water heating system and ventilation system. The company has already demonstrated a working prototype of both systems and is awaiting additional developmental expansion capital to complete these products. All three products are covered by the company's FOUR U.S. Patents.

### **2. How long has the company been in business?**

Pool Heat Company, a proprietorship, existed from 1/1/84 to 8/10/86. On 8/11/86, the company incorporated itself as Attic Technology, Inc. On 7/15/93, the company changed its name to SolarAttic, Inc.

### **3. Does the company have product liability insurance?**

The company is self-insured for product liability.

### **4. Does the company have any business references?**

The Company's banking reference is Gerry Vidmar, Assistant Vice President, Wells Fargo Bank, Brooklyn Boulevard Office, 8041 Brooklyn Boulevard, Brooklyn Park, Minnesota 55445, phone (763) 493-7807 and Fax (763) 493-4040. The Company is registered with the Securities Division of the State of Minnesota and also has filings with the Secretary of State. SolarAttic's corporate charter is MN 5H-1049.

## About Business Issues

### **1. What does the company mean by exclusive dealership?**

The company assigns a territory to the dealer.

### **2. Will the company set up more than one dealer in an exclusive territory?**

During the first full year that the dealer has been selling the PCS1, the company will give the dealer time to establish minimum sales. If, after one year, the dealer is not meeting the minimal sales requirements, the company may establish another dealer and the territory could then become non exclusive.

### **3. Will the company set up more than one dealer in a non-exclusive territory?**

Yes, if the market will support more than one dealer or if the dealer is doing poorly in a good market.

### **4. My customers do not need heaters!**

Not all pools require heaters. Good sunny locations, in hot climates, with pool blankets and enclosed or sheltered areas help. It also helps if someone likes to swim in cold pools. Some pool contractors have falsely sold themselves on the need for no heaters. Expensive to operate gas heaters have created negative attitudes in some pool dealers & contractors. Some now believe that talk of heating the pool will jeopardize the pool sale. How many buyers have been turned off at the mention of a monthly heating bill? Why over sell the customer?

If you believe this, you may be missing some business. A few years ago, I had a pool dealer tell me he didn't need heaters in his sales area of Florida. A few minutes later at the trade show, a more aggressive servicer, told me he was selling 3-7 heaters per week in the exact same area. Have you sold yourself something that is false? Now is the time to reexamine the need for pool heaters in your area! Our new product gives you a reason to reevaluate.

#### **5. Pool blankets are all we need!**

Pool blankets only remove the negative selling aspect of a pool heater in the pool transaction. A lot of pool sellers simply throw in the blanket to eliminate the heating objection in the pool sales presentation. Blankets do not create heat and mainly keep heat from escaping from the pool's surface. Pool owners will usually swim through a hot three-inch layer only to reach cold temperatures in the mass of water below this surface layer.

Blankets are a pain in the neck, but a necessity in light of high-energy bills. People get used to swimming in colder pools and prefer these colder pools to the alternative of high monthly energy bills. Blankets often require two people to place on or take off of the pool. A pool that gets by with just a blanket can get by without the blanket using the PCS1. This is a new selling opportunity for businesses. Like other manufacturers of pool heaters, we recommend using a blanket with the PCS1 when the pool will not be used for extended periods. Again, pools that use only a blanket -- may now get by without it -- when using the PCS1.

#### **6. Are new markets opened up by the PCS1?**

YES: Pool owners that swim in colder pools with a short season can now heat their pools and expand their swimming season; those who have not bought pools because of high heating costs can now do so; and, those who have shut their pools down because of high heating costs can now reopen them.

### **About The Product**

#### **1. Is the PCS1 UL LISTED?**

All parts used on the PCS1 are UL Listed except the cabinet's sheet metal parts. For example, our heat transfer coil is UL Listed with the following designation: **SR/M-58E**

#### **2. What is the life expectancy of the PCS1?**

It has a 20 year design life under optimum conditions. The primary life factor is the pool's water chemistry. Pool water properly maintained should not smell of chlorine, should be crystal clear visually, and should be potable water [drinkable]. To the extent the pool's water is not like this, it will shorten the life of all of the pool's support equipment in addition to shortening the life expectancy of the PCS1. The PCS1 has extended life characteristics when compared to heat pumps or fossil fuel heaters.

#### **3. Is the PCS1 easy to service?**

Yes, the front grille and the side panels are removable for ease of service.

#### **4. Is the PCS1 FUSED?**

The PCS1 motor is thermally protected against overload with an automatic reset.

#### **5. What kind of electrical power is required?**

220VAC outlet is required. Full load amperage is 1.8 amps. A separate, 15-amp circuit for the PCS1 is recommended. The PCS1 simply "plugs" in. Power is typically derived through the temperature controller, which automates the pool heating.

## **6. Is there any condensation in the attic at high humidity levels?**

Under extreme test conditions, very little condensate was evidenced. Under normal conditions, the bottom pan may collect minor amounts of condensate. It will then evaporate. This same technique is used on modern frost-free refrigerators. The PCS1 provides for this collection and evaporation when mounted upright. In areas where concern exists, the bottom pan can be tapped and drained off.

## **7. What is the optimum heating system configuration?**

PCS1 which exchanges free solar heat inexpensively from the attic into the swimming pool, a flowreversal™ valve that ensures the pool is efficient in its heat needs [for deep pools] and a pool blanket to minimize losses during extended periods of non use [or during non-heating hours in early and late season].

## **8. The PCS1 looks like a radiator?**

The principles of operation are similar but the radiator was designed for cars. The PCS1 heat exchanger was custom designed specifically for the needs of swimming pools.

### **About Technical Issues**

#### **1. How does SolarAttic, Inc measure BTU ratings? Sensible only or with latent heat?**

All quoted BTU ratings are sensible heat figures only. Delta temperatures can be measured with temperature sensors & sensible heat calculated. BTU figures are significantly higher if latent heat figures were included. BTU figures are higher under high humidity conditions as humid air contains more heat. BTU figures were calculated and measured under conditions of 20-30 % relative humidity.

#### **2. How hot do attics get?**

Attics have been measured at 160 degrees Fahrenheit.

#### **3. How do I get the PCS1 into the attic?**

A) In a walk-in attic, no problem, just carry it up. B) In an attic with a 2x2-foot access, enlarge the access to 2x4 feet. C) Cut into the end of the house at the peak to access the attic, then cover hole with a vent grille [found at lumberyards & building stores]. D) Cut a new access hole into attic from the inside; the unit fits between standard 24" OC [on center] trusses. E) Disassemble the unit and reassemble it in the attic [not recommended; but, can be done]. F) Cut a new access hole in the roof and mount the PCS1 on the roof with a rain cover & condensate drain provision.

Note: the PCS1 mounts in any direction, but any direction other than horizontal requires a condensate drain provision. Use your imagination and create a list of 10 different ways for each new installation. Then select the best way, keeping the plumbing considerations in mind. This is called possibility thinking!

#### **4. How can I hide the plumbing?**

You also have to use some imagination here. In new home construction, simply build the PVC pipes into the walls. In homes with a garage next to the house, access to the main attic can usually be achieved through the garage roof and pipes can be concealed. Pipes can also be hidden in larger 4" pipes or with a wood frame around the pipes for the short distance from the garage roof to the main attic area. Plastic rain gutters can conceal pipes running up the side of a house. Also, the pipes can be ran up to the attic in an out of the way or non-obtrusive location where it is not necessary to hide them.

Experience indicates this will not be an issue in the majority of cases. Pool owners are already used to electrical pipes, rain gutters and other pipes running up the outside of their homes. Neatly installed pipes running vertically from the support system equipment area into the attic through the eaves should be acceptable. They can then simply be painted to match the homes exterior color. Actual installation conditions and consumer preferences will usually dictate what has to be done.

#### **5. What kind of pipe should I use?**

Rigid CPVC 2" is recommended for increased flow and resistance to solar deterioration. Also PVC pipe 1-1/2 or 2" can be used. Use 2" pipe if your pump is 1 1/2 - 2 1/2 hp. If larger, consult a pool dealer. If outdoors, and PVC pipe is exposed to the sun, it should be painted to prevent deterioration of the plastic. Flex PVC pipe manufacturers state that it sags at 150° F temperatures and should only be used cautiously inside an attic. If the pipe will not drain down automatically in the system, this lessens the flex PVC temperature due to the water inside the pipe. Plumbing must be installed in accordance with state and local codes and good trade practices.

Experience has shown that a continuous length of flex PVC to and from the PCS1 in the attic and extending outside of the eaves where it is connected to rigid PVC pipe is acceptable. Rigid PVC pipe is used from this point throughout the rest of the support system. With the PCS1 installed in the attic, extended periods of high temperatures do not exist. Therefore, the flex PVC pipe doesn't appear to suffer. Using flex PVC inside the attic also removes any PVC cement activity, which can be done outside.

#### **6. What about roofs without three feet of height at the peak?**

Roofs can be modified to accommodate the PCS1. A) By mounting the PCS1 at the end of the house Vs inside the attic. B) By mounting within the roof itself in a waterproof way and providing for condensate drain. NOTE: The objective is to allow the roof to function as a collector and to pull heat from the inside of the roof and attic area. Once again, this is an area to use some imagination and creativity. List 10 possibilities!

#### **7. Will the system work in all attics?**

NO: Attics should be the main house attic with a square foot area equal to or greater than that of the pool's. In addition, see attic selection criteria below to determine effectiveness of attic.

#### **8. What are some attic selection criteria to consider?**

Black roofs are better than white; non shaded roofs are better than shaded roofs; all power ventilators must be disconnected; roof area should be at least two times pool area. i.e. 600 sq ft pool= 1200 sq ft roof **OR** the ceiling area (sq ft of the attic) should be at least equal to or greater than the pool's sq ft area; insulation level is not a critical factor; interior of roof should not be insulated or lined with heat resistant material.

#### **9. Will there always be enough heat from my attic for my pool?**

No: Just like other forms of solar heaters, the results will depend upon weather conditions. But, unlike solar panels, orientation to the sun is not a critical factor and the roof itself presents a more "massive collector".

#### **10. What about leaks in the attic?**

This is a real concern and represents the number one sales objection that people may have. Many water products are installed in attics and on roofs around the world. There is nothing that unusual about the concept. These products operate at 60 psi or even greater pressures. Is there a 100% guarantee that no leak is possible? The answer is NO. For the same reason you can't guarantee that your kitchen sink won't leak! To properly answer this valid question requires knowledge about the operating environment of the PCS1.

The PCS1 coil is tested under water at 350 PSI and operates under no significant amount of pressure because the swimming pool is an "open container". In operating tests, the PCS1 was shown to only add 4-6 PSI to the existing system's pressure. This typically means that the total system pressure the PCS1 is exposed to is 20 PSI or less. It is therefore, highly unlikely, that any leaks could occur in the PCS1 as a result of pressure. Again the PCS1 is factory tested at 350 PSI under water and typically operates at 20 PSI or less.

A second issue is the plumbing to and from the PCS1. Here again are the dynamics of the pool. PVC pipe is rated at 120 PSI and again the system only operates at a fraction of this. It is important that all plumbing be professionally installed and that no questionable plumbing joints be accepted.

An acidic pool condition could quickly eat away the coil causing a "hole". In addition, an improperly winterized system could result in a "hole" caused by freeze damage to the PCS1 coil. The latter case has already occurred and the result was a small leak in the attic estimated at 1-2 gallons per minute. The system was turned off quickly and only a minor ceiling stain resulted from this leak. Had this system been inspected prior to spring startup, no problem would have occurred since the "hole" caused by improper winterization would have been detected and repaired first. It is recommended that an annual inspection is made at spring startup to ensure all pipes and other system parts are functioning properly and that no deterioration or freeze damage has taken place within the attic.

**Design protection has been added** to the PCS1 in the form of an internal float within the base pan. In a normal instance, only a pint or two of water would collect and eventually evaporate. In the event of a leak in the coil that sprayed water into the PCS1, the float would rise and automatically turn off the PCS1 when the water level exceeds 3/8 inch. Cutoff is accomplished by opening the attic temperature sensor, which causes the solar controller to turn the bypass valve off. Note: this protection is only afforded when in full automatic mode with the solar controller. Turning the unit on "manually" ignores this protection feature.

**Added protection** can be obtained by using a simple leak protection liner placed under the PCS1. This can be in the form of a small kid's plastic swimming pool, which is tapped into with a garden hose and drained off to the pool area. The company expects to have a custom leak liner available in the future for purchase.

The biggest threat to the PCS1 is a poorly maintained swimming pool that turns acidic. Your pool water should be crystal clear, not smell of chlorine and be potable [drinkable]. This is not hard to obtain from proper pool water maintenance. If you have questions -- contact your pool chemical dealer and get educated. In the event an acidic pool does cause damage to the PCS1, the small amount of leaking water would either cause the PCS1 to automatically shut itself off or be collected safely and drained off [by liner]. Any serious accidents to the attic or ceiling area are usually covered by homeowner's insurance policies. Policies do not usually cover replacement of equipment and repairs due to owner negligence!

**Further protection** can be achieved by mounting a sheet metal plenum on the coil end of the PCS1 and connecting the other end of the plenum to flexible duct. In this scenario, the PCS1 would be installed over the garage area and draw air from the main attic. To be effective, it must have a clear path to draw and return the hot attic air. This technique has been used and works very well. The company expects to have a custom plenum kit available in the future for purchase.

## 11. How do I plumb the PCS1 into the system?

The PCS1 is plumbed into the support system after the pump and filter. Any chemical dispenser must be downstream of the PCS1 and should have a chemical check valve installed.

## 12. What does flowreversal™ do?

Flowreversal™ reverses the flow of water in the pool. It takes water off of the top of the pool and returns it to the bottom of the pool for more effective heating. In tests, the pool's heating needs have been demonstrated to be significantly less (1/3 rd to 1/2 less).

No degradation of filtering or cleaning effectiveness occurs. In fact, the pool appears visually the same to the pool owner in either normal or reverse flow. Flowreversal™ is accomplished by the simple 90° turn of a single manual valve. A proportioner valve is used in conjunction with the flowreversal valve to effect proper skimmer action during reverse flow. See plumbing diagrams.

Experience has shown that a swimming pool can simply be left in reverse flow unless the pool is being cleaned or drained. Flowreversal™ enables the pool to be efficient in its heat needs. This in turn allows the PCS1 to provide greater capacity and heating margins in adverse environments. The PCS1 has been found to work effectively without the flowreversal valves. However, the swimming pool is considerably more comfortable with the valves [especially large or deep pools]. Flowreversal™ is a trademark of Mark Urban of Tustin, California.

### **13. Can I use a heat pump in my attic?**

No: Heat pumps are typically not designed to withstand the extreme attic temperatures. Operating a heat pump in an attic can easily lead to premature failure of its compressor system.

### **14. What is the difference between the PCS1 and Heat Pumps?**

In a comparative energy study, heat pumps were found to use seven to twenty-eight times the electrical energy! With the average heat pump using 12.1 times the energy use of the PCS1. Heat pumps use Chlorofluorocarbon chemicals [CFC'S] in the compressor heat producing cycle. These chemicals pollute our environment by damaging the earth's protective ozone layer. The PCS1 uses no chemicals. The PCS1 also has extended life characteristics when compared to heat pumps.

### **15. How does the "Coefficient Of Performance" [C.O.P.] compare with heat pumps?**

A typical heat pump C.O.P. is calculated as follows:  $57,000 \text{ btus output} / 11,977 \text{ btus input} = 4.75 \times 100 = 475\%$ . For comparison, the PCS1 is calculated as follows:  $60,000 \text{ btus output} / 1351 \text{ btus input} = 44 \times 100 = 4400\%$  EFFICIENT. In other words, the PCS1 has ten times the efficiency of the typical heat pump and 44 times the efficiency of electric resistance heaters.

### **16. How does the system really work?**

The roof functions as a "massive solar collector"---collecting solar heat. The attic functions as a heat storage and transfer device---storing and transferring solar heat. And, the PCS1 functions as an "exchanger" that exchanges the heat from the attic into the pool. This is a continuous solar process.

### **17. What's the worse that can happen with a conventional heater's operating costs?**

The kids can turn it up to maximum and run up hundreds of dollars in energy bills while you are away!

### **18. What's the worse that can happen with the PCS1 heater's operating costs?**

On a cloudy and cold day, you won't get much heat. However, you will never get a high-energy bill!

### **19. What are the optimum installation conditions?**

A non dusty environment; a non corrosive atmosphere; proper pH chemical balance between 7.2 and 7.6; automatic chlorine dispensing to keep levels below 3 parts per million or the use of a nonchlorine alternative; a water flow rate of 45-55 GPM; black roof; sunny roof; sunny pool; manual Flowreversal™; use of a pool blanket during extended periods of non use; a non salt water pool; some shelter of the pool to minimize convection losses. Plus other factors that help minimize a pool's heat losses.

## 20. Can the PCS1 heat spas?

Yes! The PCS1 has been used to heat water up to 105° F. SolarAttic, Inc. expects to have a separate spa version on the market sometime in the future.

However, in the meantime, **another opportunity avails itself**. That is the sharing of the heat from the attic with both the pool and a spa. This is especially true during periods of time when the pool cannot use the heat available. During these times, the heat can be channeled 100% of the time into the spa. A recent study showed that up to 25% of new pool installations are being installed with a spa attached to it.

To share the heater requires the use of a Share-a-Heater™ valve. With a simple 90° turn of a single valve, the spa can be heated instead of the pool. The valve allows the sharing of a single heater and it can be automated. Share-a-Heater™ is a trademark of Mark Urban of Tustin, California.

## 21. How does the color of the roof affect performance?

The following factors give you an idea of how roof color affects heat. (See paragraph below)

Black	1.28
Dark Blue	1.21
Blue	1.14
Dark Brown	1.07
Brown	1.00
Red	.86
Green	.71
Dark Grey	.71
Grey	.57
White	.57
Smooth White	.36

If good conditions exist for the pool, then just about any color of roof may be acceptable with the PCS1, Flowreversal™ and the use of a blanket. This would be especially true on relatively small pools (450 sq ft) and large roof areas. Grey, white, and smooth white may be marginal on a large pool with an extremely small attic to draw from. The above factors can be interpreted as follows: The PCS1 will perform nominally, or 1.00, with a Brown roof. Other colors will increase or decrease relative performance; however, a large roof with a poor color factor may out perform a smaller roof with a good color factor. Due to the solar radiation and BTU availability. Larger numbers are better performers.

## 22. What are some environmental factors?

Outside blanketed pool & Flowreversal™	2.00
Outside blanketed pool	1.00
Screen & blanketed pool	.80
Outside, blanketed & windy	.67
Outside without blanket	.42
Screen without blanket	.33
Outside, without blanket & windy	.29
<b>Water table</b> (multiply above factors by)	.80

The above environmental factors show that the PCS1 will perform twice as good with Flowreversal™ and a blanket. The larger the number, the better the conditions of performance with the PCS1. **The dealer or purchaser is responsible for determining whether the PCS1 is suited to a particular installation and operating environment.**



### **23. Is there a simple test to determine if an attic will be good enough?**

Yes, generally. On a 70° F sunny day, find out what the temperature is inside the attic at its peak. Acceptable attics will be 100° F or higher. Take the test when the Sun is shining and between 1-4 PM in the day. Power ventilators must be turned off the day before.

Some natural air vents or wind driven turbines may have to be shut off also. This test assumes that Flowreversal™ and a blanket are used with the system and that the attic is equal to or greater than the pool's surface size in square footage [Or, the roof itself is two times the size of the pool in sq ft area].

### **24. How is the PCS1 winterized?**

In areas where the pool needs to be winterized, the PCS1 also needs to be winterized. Winterize the pool as otherwise would be required. When blowing out the water from the support system's pipes with air, cycle the bypass valve and blow out the water through the PCS1 also.

After the pump has been shut down and secured to prevent it from restarting, winterize the PCS1 by first removing the inlet union on the top of the PCS1 and tilting the opposite side up two inches to ensure all water is drained out of the bottom of the PCS1 coil through the outlet pipe. Then remove the outlet union and add 1/2 gallon of non-toxic antifreeze to the bottom of the PCS1 coil. Reconnect both inlet and outlet unions. The PCS1 has been winterized. Now finish the balance of the support system and pool winterization.

### **25. How is the PCS1 started up in the Spring?**

Visually inspect the PCS1 for any signs of freeze damage caused by improper winterization. Specifically inspect the bottom of the finned pipe area for any signs of damage. Do this from the rear of the unit [finned side] and also from the front of the unit inspecting through the protective screen. The side panel can be removed for an internal inspection if desired. Check the inlet and outlet unions for proper connection and tightness. Do not over tighten PVC unions.

Open the pool up but leave the bypass valve and PCS1 off until the pool water is once again clear visually, does not smell of chlorine and is potable [optimum chemically for swimming]. Once the algae growth, other debris, etc. has been removed and the pool is ready for swimming chemically, then activate the PCS1. This procedure prevents the initial poor chemical environment caused during the extended time being winterized from entering the PCS1 and reducing its optimum life expectancy.

### **26. Is the PCS1 as efficient as a solar panel system?**

The real question is: "Will the PCS1 work as well as a solar panel system on my house?" On a roof where a properly sized solar panel system will work, the PCS1 will work better for two reasons. First, the area of collector is more massive in the form of your roof. This means that more solar energy will be available in the form of heat than could be expected from a solar panel system [solar radiation radiates on more surface area]. Second, if installed with flowreversal™ as specified, the pool will make better use of the heat put into it by being an efficient pool. Remember: heat rises and 60-70% of the heat loss on your pool is directly from the surface of the pool. It doesn't make a lot of sense to heat water and put it into the top of the pool. With flowreversal™, the heated water rises from the pool's main drain making the pool an efficient user of heat! SolarAttic offers a unique performance guarantee. SolarAttic guarantees that your system will perform as good as or better than any solar panel system or we will buy it back. See the company's "Performance Guarantee."

**27. Why not just install the flowreversal™ valves and use a pool blanket?**

You can. In fact, we supply the flowreversal™ valves for you along with instructions. However, remember that the true function of a pool blanket is to minimize the surface heat losses from the pool [not to supply heat to the pool]. With flowreversal™ you'll find that your pool performs better! Remember also that the pool blanket can require two people to place on and take off. Or, a big "roller" at the end of the pool that constantly gets in your way. Any pool that can produce an acceptable swimming environment with flowreversal™ and a pool blanket -- can produce an even better swimming environment with the PCS1. You may even find out that little or no use of the pool blanket is required except at the start or end of your season!

**28. My pool was just built; do I need the flowreversal™ valves?**

Some newer pools are equipped with in floor circulation systems that provide a better cleaning environment while allowing the heated water to rise from the bottom of the pool. Consult with your pool contractor to determine if heated water can rise from the bottom of the pool. If it can't, we recommend that the flowreversal™ valves be installed.

**29. I have an aboveground pool; do I need the flowreversal™ valves?**

Aboveground pools can alter the plumbing pipes to allow the water to rise from the bottom of the pool if desired. The flowreversal™ valves are not needed.

**30. I want to replace my existing solar panel system; can I use the existing controller?**

Existing solar systems that still have a functional controller and bypass valve do not need these components. We still recommend the flowreversal™ valves since most solar panel systems will not have them installed with the system. Check with the installer of your solar panel system if you have any questions.

**31. How do I know if my pool pump can handle the additional "head"?**

a) Determine the vertical distance from the pump to the PCS1 located in your attic; b) divide this vertical distance by 2.31 to calculate the added pressure to the pump; c) add this additional pressure to your existing pool's pressure which can be usually read directly off of a filter pressure gauge; d) ask your pool contractor if the pump installed will handle the total pressure [added lift].

An alternate approach is to use the existing pump and observe for any problems. If the pump is inadequate, poor filtration will occur resulting in a "cloudy" pool [Note: this would be the direct result of a dramatic reduction in the pool's water flow rate]. Also the pump may cutoff due to thermal overload. Repeated cutout of the pumps thermal breaker indicates the pump is too small. Upgrading by 1/2 horsepower should do the job.

You cannot simply feel the side of the pump's motor. The motor should normally be running "too hot" to touch. If the pump was sized for filtration using a timer [less than 24 hours], the pump is probably adequate in size to handle the lift to the PCS1. If the pump is running 24 hours a day [no timer], it may require upgrading. This latter case allows a pool contractor to install a smaller pump to accomplish the same filtration needs that a larger pump will accomplish in less time. Both approaches are used for a variety of technical reasons. In fact, it's still argued [in the industry] about which method results in the least amount of pump operating costs.

**32. How can I lift the PCS1 into the attic?**

One approach to the attic installation is the enlarged closet access [see question #3]. Assuming you have used this approach, install an eye bolt near the peak and use a one ton come along or other pulley type of device to lift the PCS1 up into the attic. Be sure to center the lift and use straps under the unit. See the installation manual for additional details.

### **33. How is the PCS1 delivered?**

The PCS1 is shipped in a wooden crate that weighs 246-253 lbs. This crate must be removed from a carrier's truck, which can range from a small delivery truck to a semi trailer. When the carrier calls, tell them you'll need help removing the unit from the truck. Make sure they have a lift gate and a dolly. This will make it easier to remove the unit from the truck. If no way exists for removing the unit in its crated state, unpack the unit and inspect it. This will reduce the weight down to 134 lbs. and two people can easily handle it.

### **34. Can the PCS1 cool down a hot pool?**

Yes: The PCS1 can be manually turned on during the evening hours to cool down an overheated pool. In this case, the heat exchanger will work in the reverse mode. The hot pool water will be routed up to the PCS1 while cooler attic air will be drawn across the heat exchanger. This manual operation ignores the temperature control sensors. To be effective, some ventilation must be present in the attic to allow the heated attic air to escape into the atmosphere.

Cooling down an overheated pool is a common need during the hot summer months in some parts of the country.

### **35. Can the PCS1 be fully automated?**

Yes: The PCS1 can be fully automated by installing the Compool LX220 temperature controller available from SolarAttic, Inc. An electric valve actuator [VOR for valve operator] physically sits on top of the bypass valve. When heat is available for the pool or spa, the controller automatically turns the VOR, which then turns the shaft of the bypass valve to the correct position. The pool owner simply sets the desired temperature on the controller.

### **36. Can the PCS1 be controlled in an inexpensive way?**

Yes: The PCS1 can be semi automated by using the existing pool's timer in conjunction with a manual bypass valve and a daylight sensor. The bypass valve is left in the on position. The pump timer operates the pump during daylight for 10 hours. The light sensor ensures the pump only runs during daylight.

This simple automation assumes that when it is daylight, heat will be available. It has some drawbacks and limitations. First, if heat is not in the attic, the PCS1 could operate in the reverse mode and may actually be cooling down the pool. Second, filtration time may be confused by lack of sunlight. An alternate method is to simply operate the bypass valve manually each day.

For best results, the company recommends that the PCS1 be fully automated so maximum heat can be extracted automatically from the attic and put into the pool.

### **37. Can the PCS1 be used for year around heating of my pool?**

Generally, No: The PCS1 will function year around in many locations taking out all available heat from the attic and putting it into the pool. However, a more appropriate question is: "Will the PCS1 heat my pool to 85 degrees year around?" We do not know of any location where the PCS1 will do this in the United States. We also do not know of any location where solar panels will do this in the United States. As a rule of thumb, the PCS1 will usually perform as well as a solar panel system that is properly sized. Even in southern parts of the USA, solar energy wanes and does not work well during the months of November through January. By mid February, solar energy begins to intensify and it performs better for the pool. You can expect to significantly lengthen your swimming season with the PCS1. And, your enjoyment of the pool will be much greater. However, in the USA if you want year around heating of the pool, you will need to augment the PCS1 with a conventional heater during non-solar periods. In some tropical areas, we expect that the PCS1 would heat the pool year around to a comfortable temperature.

## About Sales Issues

### 1. What is the expected full retail price of an installation?

Contact your local distributor or dealer for current prices of equipment and installation. The Total installed cost will depend upon dealer pricing policies and the difficulty of the installation. It will also depend upon whether it is a Manual System, Auto System or Auto+ System with flowreversal.

### 2. What is the payback period of the PCS1?

Payback is estimated between two-four years when compared to gas heaters and one year when compared to electric heaters.

### 3. Are dealer opportunities available?

YES. This is one of the most exciting and hottest business opportunities existing! And, **it's now!** Limited exclusive territories are available. A limited amount of factory dealerships will be granted so our dealers will have a "real opportunity". It is also "ground floor" and "wide open". The opportunity also does not cost an arm and a leg or a lot of "blue sky". The company is seeking long term win-win relationships. The product is a "patented & exclusive" one.

### 4. What are some benefits for swimming pool owners?

- **Energy savings** that put money into their pocket. The PCS1 pays for itself!
- **Personal satisfaction** reducing the "ozone problem" by not using chlorofluorocarbons.
- **Personal satisfaction** in reducing the "greenhouse" problem by not using fossil fuels.
- **Personal satisfaction** in using an alternative renewable solar energy resource.
- The **aesthetic beauty** of enjoying solar energy benefits without "ugly & obtrusive" roof panels.
- The **comfort & luxury** of swimming in a warmer swimming pool.
- The **relief from budget busting energy bills** and "restrictive energy use laws".
- The **additional energy savings** from reduced or eliminated air-conditioning costs.
- The **availability** of electricity to run the PCS1 as opposed to natural gas and other fossil fuels.
- The **practicality** of using attic heat to solve their swimming pool heat needs.
- The fast **payback** period and knowing that the system will result in continued energy savings.
- Having a **solar** device that heats their pools without all the problems of solar panel devices.