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April 24, 2008

Solar Energy; Not Just Electricity

by Victoria Hollick, Conserval Engineering

A common inaccuracy that I frequently encounter -- through work, in the media, and in government -- is based on an implied assumption that energy, and energy displacement, and therefore solar energy, revolves solely around electricity.

This perception is pervasive in several countries around the world. Articles, position papers, lobbying briefs and individuals reference the fact that close to 40% of carbon emitted into the atmosphere in the United States originates from the operations of buildings (correct) because of the use of fossil-fuel powered electricity generation sources (not correct).

What is missing here is the heating component. It is a statistical fact that in heating climates, buildings usually use significantly more energy for heating purposes than for electricity. In other words, the 40% of CO2 emissions that originate from the building sector represents the sum of two types of energy usage -- electricity and thermal -- not just electricity.

Now, this statement may seem obvious and rudimentary, but reflect on how often the "renewable generation of electricity" completely dominates the energy discussion, while overlooking the idea of "renewable generation of heat." The result is policy recommendations that are at best, only half complete because they are missing a large part of the problem, as well as an opportunity for cost effective energy and CO2 displacement

In the southern states, it is true that a majority of energy consumption originates from air conditioning and electricity. But in the mid to northern latitude states, a significant proportion of the CO2 emissions from the building sector arise as a result of heating buildings. Heating ventilation air and general space heating in the spring, winter and fall, as well as water heating throughout the year, usually accounts for upwards of 60% or more of a building's energy usage and corresponding CO2 emissions. And it is this heating component that is so often overlooked.

Consider the following example. I was recently reading a report in which PricewaterhouseCoopers calculated that in the city of Toronto -- which has 4000 heating degree days, and is therefore comparable to cities like Minneapolis,

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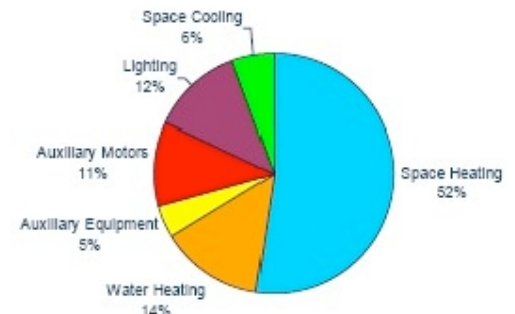
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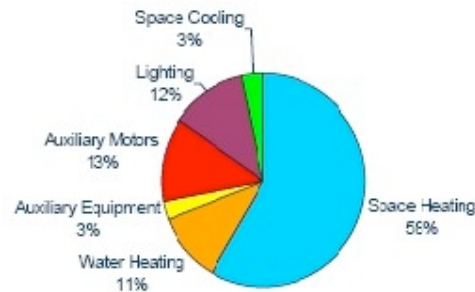
Detroit or Chicago — 60% of the energy used in commercial buildings was for heating, while 40% was used for electricity. The proportions were similar for all the other types of buildings examined, and I include the graphs below.



Energy End Use: Commercial Retail



Energy End Use: Healthcare



Energy End Use: Schools

So, given that commercial, industrial, and institutional buildings in heating climates use significantly more energy for heating purposes than electricity, if the goal of governments is to reduce the CO₂ emissions originating from the building sector — which of course it must be — the reader can automatically see wherein the problem lies with having a one-track focus on electricity reduction.

Now in areas where there are electricity shortages, it is understandable why generating clean electricity from renewable sources is such an important consideration. However, the point that must be made is that for any energy strategy to be successful in achieving maximum CO₂ reductions, it must include incentives and specific policy directives aimed at spearheading the solar thermal industry as well, not just photovoltaics (PV).

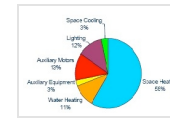
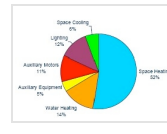
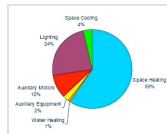
This would also serve the very important economic objective of helping domestic businesses improve their overall competitiveness by stabilizing the volatile energy component of their operating costs. When you consider that the price of natural gas on the New York Mercantile Exchange now sits at US \$10 per thousand cubic feet — double what it was only a year ago — it clearly highlights a very strong business case for technologies that displace natural gas or heating oil. And since solar thermal systems (air and water heating) can fit into an acceptable corporate payback period, the potential uptake in solar thermal over the next few years is enormous. The basic fact is that these technologies present a very compelling business case, from both a cost reduction and CO₂ displacement perspective.

For these reasons, the European Union has announced explicit "Green Heat"

targets as part of their overall mandate to generate 20% of *all energy* from renewable sources by 2020. France specifically identified solar thermal targets as being necessary to achieving their required CO2 reductions. Given that Europe has always been a world leader in terms of solar policy and deployment, we are hopeful similar objectives will be duplicated in North America - for the benefit of the environment, as well as energy and economic sustainability.

Victoria Hollick is the VP of Operations at [Conserval Engineering](#), which has been instrumental in promoting solar air heating around the world for the commercial & industrial sector with the SolarWall transpired collector. Victoria has had a life-long interest in solar, and became further interested in effecting environmental and renewable energy policy while completing a graduate degree in economics. She is also the Vice President of the [Canadian Solar Industries Association](#).

Image Gallery (4)



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Author:
[John Briggs](#)
Date Posted:
April 24, 2008

It is remarkable that solar thermal is the Rodney Dangerfield of the Solar industry. "I don't get no respect." Clearly its merits are great, so it is a bit of a puzzle to me why it isn't more well supported. One possible reason is the industry has a black-eye from the 80's era batch solar thermal system. To this day, I know people that have recently removed "failed" or neglected systems from their homes. I also see buildings with failed systems still attached to their roofs. They stand as a monument to technology that didn't work out. This is a difficult impression to overcome. I don't think PV has this same historical perception. Another possible reason is that PV is so elegant. There are no moving parts. There is no maintenance. No water to leak out. It is just a nice clean install. I recently contacted six references for a solar system installer. The people had both Solar PV and Solar Thermal. They were all happy with both systems. However, two out of six people had water leaks on their new solar thermal systems. The problems were quickly resolved, but it does give pause to anyone thinking about solar thermal. Another possibility for the lack of respect to solar thermal is business/government interests. In my area, there is a company that manufactures solar PV panels and another one that makes inverters. There has been a clear MA state government push to support these people. There are no similar business interests for solar thermal. Lastly, I think electricity is much easier to measure and make a case for economically. I can easily tell how much

electricity I use per day. But I have no idea how much oil I used for heat or hot water. So saving seem more difficult to understand.

It seems that solar thermal needs better marketing.

Comment 1 of 31

Author:
[Jonathan Cole](#)
 Date Posted:
[April 24, 2008](#)

Solar thermal is also much more efficient collector of energy than PV. But there is an important consideration for building in cold climates - long periods without sun. Therefore, the solar thermal system requires backup. A backed up system costs more.

I believe that before investments are made in solar thermal, they must be made in building heat-trapping efficiency. Insulation, ventilation, double/triple glass windows, etc. It has been shown in many investigations that buildings can be engineered to require little additional heat beyond that which is cast off by appliances, lighting, body-heat and solar insolation that naturally arrives through windows. Above all, we need to employ cost-effective strategies if we are to reverse the destruction of our habitat by inappropriate use of technology. We need to develop a way to live lightly on the earth.

<http://lightontheearth.blogspot.com/>

Comment 2 of 31

Author:
[William Fitch](#)
 Date Posted:
[April 24, 2008](#)

Hi John:
 I agree with all that you say. Ironically, solar thermal on average runs in the 50 to 80 percent range as opposed to 20 percent efficient PV. Most of the energy "visibility" issues can be fairly easily solved at the system level, and useful and accurate information presented. The huge efficiency difference should win out easily in a level playing field based only on the engineering. Most of the "real" driver differences, comes down to money, as always. Power companies and grid providers want to shed peak load off to cheap localized PV installs VS upgrading infrastructure or bringing new plants on line, a SLIGHTLY more expensive endeavor.... Power companies save many millions in payments to the grid providers by cutting that peak Summer AC load where their (the Power company) rates to the GP's are on a very, very steep part of the curve. Also, the benefit of PV is targeted at one energy industry, electricity. Solar thermal whether DHW or space heating sheds load from any one of half a dozen industries be it, oil, propane, NG, electric, coal, combustible renewable, etc.. So, no one industry stands to gain a big share of reduced load. In fact, most of the energy industries want more of their product sold, NOT LESS!! What business wants to sell less of their product so they can make less money??? It's just with electricity, the high cost of increasing distribution capabilities and/or increasing centralized capacity and a narrow seasonal peak load window, opens scenarios where, "less means more". This is what has given rise to the big push behind PV VS thermal. Its really easy, just follow the money.....

Comment 3 of 31

Author:
[Joe Bloggs](#)
 Date Posted:
[April 25, 2008](#)

Of course, although this is an article about solar heating, the big omission here is the energy efficiency of buildings. New build can now mean that space heating is redundant (eg: Passivhaus designs), and even if you don't go to these lengths, space heating requirements can be reduced to very low levels. Retro-fitting existing buildings is more problematic, but there are still many things that can be done in terms of insulation. This should always be the first port of call - it will always be more efficient and economic to insulate a building - once you've done this, then think about solar thermal for the reduced requirement you've created.

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Author:
[John Briggs](#)
 Date Posted:
[April 25, 2008](#)

William,
 I appreciate your comments about the financial drivers of solar PV versus solar thermal. On the willingness of electric power utilities to accept solar PV, I have often heard that they fought against its introduction. However, I have no first hand experience with this. I think it makes perfect sense for them to accept PV for the peak loads that you mentioned. However, I have never heard anyone else claim a sort of "warm embrace" of the electric power utilities for solar PV.
 I know solar thermal can be used for home heating and Domestic Hot Water (DHW). But in Massachusetts, it seems like the most common retrofit application is DHW. In talking to users about this, they can get all their domestic hot water needs from April to September from the solar thermal system. This is a significant savings. In the winter, the solar thermal system acts as a pre-heat for domestic hot water.
 I also much appreciate the comments that the solar thermal DHW system needs a backup heating system. It cannot be relied upon as the only system. This can require duplicate systems in the house. However, one system that I saw installed for DHW was particularly elegant. They used a conventional hot water tank and replaced the lower heater with heat exchanger for the solar thermal system. The upper electric heater was left intact. So when supplemental heat was needed, it could be provided with electric heater. This resulted in a system with only one tank.
 Thanks
 John C. Briggs

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Author:
[Art Toy](#)
 Date Posted:
[April 25, 2008](#)

Our farmhouse is a hybrid system in which electric from grid connected wind powers our all electric home which uses geothermal for heating/colling. Solar thermal provides the bulk of our hot water needs and solar electric is only used to pump the propylene glycol from the solar thermal collector and the heated glycol is sent into the heat exchanger by the 120 gallon solar tank which then supplies a small 40 gallon electric tank. We have a slide presentation on CNN's iReport website as part of the Planet in Peril series.

<http://www.ireport.com/docs/DOC-9941>

Thanks, Sharon, Jian and Art Toy; Lawrence, Michigan

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Author:
[Benjamin Gorman](#)

Date Posted:
[April 25, 2008](#)

Thank you for this article and this discussion (PV v. Thermal). It presents a much-needed correction to the popular misperception of energy usage and priorities. I work as an educator for a renewable energy retailer in Massachusetts (Alternative Energy Store) and, judging by our daily stream of calls and emails, the public mind is indeed fixated on the magical elegance of PV and (more problematically) on the hypnotic effect of a spinning wind turbine! Solar thermal is far less expensive, vastly more efficient, and enjoys a very brief payback--- yet this truth is largely absent in popular and media discussion. Argh! Sorry, I just get so impatient!

In fact, solar thermal water heating has a long history in the U.S., but the technology was discarded in the heyday of cheap electricity and utility maneuverings. The 70s/80s black eye didn't help bring it back. But back it will come! This weekend, AltE Store is hosting a class in solar water heating given by industry expert Bob Ramlow; at least the dozen or so people attending will come away (we hope!) convinced of thermal's priority position in home energy greening (not to slight building efficiency!). And these attendees will pass the word on to others. Slowly but surely people will see the light... and feel its heat. www.altestore.com

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Author:
[Chip Harvey](#)
Date Posted:
[April 25, 2008](#)

A quick perspective on solar thermal for indoor swimming pools. Traditional buildings as noted in this article heat the air, while natatoriums heat the water, and evaporative cooling, which is heat loss, heats the air. All indoor pools anywhere in the country are heated year round to 79 or 86 degrees or higher depending on use. About 97% of indoor pool heat loss and humidity gain are due to evaporation and ventilation. This accelerates at night when temperature differentials become greater vs. outdoors.

We own 5 commercial pools in 2 natatoriums in Atlanta. The water surface area is 28,700 sf, and we have installed 500 solar thermal panels totalling 27,000 sf. Plus we use pool energy blankets from 10 PM to 5 AM. For 4 years now our conservation savings on gas is about 50% or \$200,000 per year. 40% of this is attributable to solar, but 60% is preventing existing heat loss by stopping evaporation for 7 hours at night. Blankets also save 50% on water consumption or 4.6 million gallons worth \$27,000 annually. CO2 greenhouse gas emissions have been reduced by 900 tons a year.

The solar thermal systems cost \$225,000 and had a 1.5 year payback due to the blanket contribution. The blankets cost peanuts and had a 2 month payback. If natatoriums are dehumidified, ours are not, energy blankets stop the source of humidity gain and save an

equally large amount of electricity - note HVAC/dehumidifiers run 24/7/365. Green and clean is great, but ongoing financial benefits are what really drive this. Solar air is of interest, because indoor pools must be ventilated continuously to remove chloramines (unhealthy air) and reduce condensation and corrosion. The potential energy savings for year round indoor pools is so big, we are developing our own more efficient energy blankets and operating techniques to make life easier for pool operators and life guards.

harvco@mindspring.com

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Author:
[EUGENE Lucas](#)
 Date Posted:
[April 25, 2008](#)

I must have missed something, but then I live in California where the sun shines a lot. But solar-thermal heating here is also neglected, and possibly even more important - solar-thermal cooling. But I'm not talking about passive panels, I'm talking about concentrated solar-thermal, either with troughs or concentrating antennas; and I'm talking about locally generated energy! There are many technologies available to distribute the heat collected by the solar-thermal elements; and several that can turn the heated fluid into cooling air.

Here in California nearly all our peak electrical demand is for air conditioning, requiring about 12.5 Gigawatts of capacity on a hot day. Now that power comes from gas turbines that are fired up for the peak hours, at very high prices. Solar-thermal installations on commercial building roofs, and over mall parking lots, could possibly eliminate the need for that peak power.

But, direct use of solar thermal technology (especially active) indeed "gets no respect" out here either. Hopefully someday!

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Author:
[Gary Tulie](#)
 Date Posted:
[April 25, 2008](#)

Of particular interest to Chip.

Have a look at

1.Heat recovery ventilation. This can reduce heat losses with ventilation air by up to 80%. Combined with a condenser, this might also allow recovery of much of the evaporated water.

2. Water to water heat exchangers for the shower units. The showers in public swimming pools are used almost constantly, so why not pre-heat the cold feed using warm water entering the drains. This can reduce shower hot water demand by around 60%.

3. Waterless / low flush Urinals - These could possibly add a further significant water saving to your operation.
<http://www.gentworks.co.uk/home.php?cat=253&gclid=CJPMjazz9pICFQOc1AoduUN2GQ>

On a more general note, don't forget the possibilities for reducing electricity consumption by making better use of natural light.

<http://www.sunpipe.co.uk/sunpipe/?gclid=CL2zuvHz9pICFQWIIAodHTZWBQ>

Also, for air conditioning, wetted medial evaporative cooling in dry hot conditions can reduce electricity consumption by 90% compared to conventional air conditioning.

<http://www.workspacecooling.co.uk/index.html>

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Author:
[William Fitch](#)

Date Posted:
[April 25, 2008](#)

Hi John:

No, its not warm and fuzzy, its do you want to eat SOS plain or SOS with barbecue sauce.. They all hate RE off course.. It threatens, and always has, their revenue stream. Its just that local PV offers a narrow window to save some money in the near term (decade of two). Eventually the infrastructure and plant capacity will be increased. Nukes are already in the works... that tree has already fallen again... The GP though won't get a real view of it though until the ship has sailed and is out of sight... The direction we take is controlled by big money. The technology will be released at a rate that will maximize their profits, not the rate that planet engineering requires. Gov unfortunately can not be the answer because they are controlled by the same money baskets... Its a very nasty and depressing situation for the long term well being of the human species and planet..... BTW, that single tank system is called a boost system. It eliminates one storage tank but has a lower solar system efficiency and less solar thermal storage capacity, but is lower \$ on the front end....

.....Bill

Comment 11 of 31

Author:
[william hughes](#)

Date Posted:
[April 25, 2008](#)

The situation is even more extreme than the author indicates. Using solar energy directly for, for instance, heating, avoids the transfer of energy from one form to another and into and out of storage, each of which reduces the net amount of energy available for the final use. You get far more energy per square metre of expensive solar collector if you use the heat directly than if you produce electricity from it.

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Author:
[Carolyn L.](#)

Date Posted:
[April 25, 2008](#)

I keep reading how solar thermal water heating is supposed to have a short payback time, but I haven't been able to get the numbers to work out for me. I think I'm hung up on the problem that the warranties tend to be about 10 years, which is shorter than my payback time. I suspect that the actual life of the systems are longer, but I'm unwilling to base my calculations on vague assurances.

Using some of the cheaper models (since I don't have to

worry about freezing where I live in California), it looks like I could possibly save \$100/year on my water heating bill based on data from <http://www.solar-rating.org/ratings/annuals/CAZONE1220080328.PDF> But the systems cost at least 15 times as much as I could save in a year, and that's just the equipment, not including the installation costs. Meanwhile, my rooftop PV system will pay for itself within 15 years. I'll have to wait for the California solar hot water incentives to become available before I re-consider solar thermal.

Point me to some California success stories with actual data, not projections, including installation costs and starting with natural gas hot water.

Comment 13 of 31

Author:
[Thomas Schmidt](#)
Date Posted:
[April 25, 2008](#)

Not trying to be insulting but some of you in the renewable energy industry should setp outside of yourself and look back at who and what you are. Your all obsessed with energy and using energy. If I am wrong please tell me.
Isnt choosing renewable energies choosing the lesser of two evils?

Comment 14 of 31

Author:
[Jonathan Cole](#)
Date Posted:
[April 25, 2008](#)

Carolyn, that assessment that you are using is fundamentally misleading. The most obvious way is that it is based on a 64 gallon a day usage pattern. That is enough for the extremely spartan hot water needs of one person. A couple of showers and your done. In fact with solar hot water systems, the more hot water you require during the daylight period, the more money you save. Also, before bothering with the solar thermal, if your tank is electric, buy a 35 dollar water heater timer at your local hardware store, install it (an hour for a competent electrician) and set it to turn off your heater an hour after the household is asleep and an hour before it arises. Most modern water heaters can recycle very quickly from cold and will be nice and hot before you get up. The return on investment? 1-2 months in many cases. After that its like free money.

Comment 15 of 31

Author:
[John Briggs](#)
Date Posted:
[April 26, 2008](#)

William Fitch,
Thanks for you input here.

Businesses do what they must do to survive. It is hard for me to fault them for that.

It does seem like the government really needs to step up to the challenge of energy needs, but they have generally failed to do so, particularly at the national level.

But lately, I have been starting to think that consumers are the largest part of the problem. There continues to be strong growing demand for all forms of energy. People have larger houses, bigger cars, drive more

miles, and consume more electricity. These trends are undermining the efforts of the renewable energy community.

This seems like the area to address: conservation.

Thanks
John C. Briggs

Comment 16 of 31

Author:
[John Briggs](#)
Date Posted:
[April 26, 2008](#)

Thomas Schmidt,
I am not sure I understand your point. This is the forum for discussing energy and energy conservation. Of course people are going to focus on that here. I am sure everyone has other interest as well. But this is the place to discuss energy.

Are you suggesting that people are overly "self righteous" in their discussion of energy? If that is what you are getting at, then I understand.

As far as renewable energy being the "lesser of two evils" goes, I think you raise an interesting question. I don't know that there is anything evil about traditional energy or renewable energy. However, there does seem to be significant environmental and financial benefits from renewable energy. For that reason, I think it should be promoted.

Thanks
John C. Briggs

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Author:
[William Fitch](#)
Date Posted:
[April 26, 2008](#)

Hi CL:
Yes, \$100 is a wrong number. Most households can use \$20 a month at .10 a KWH rate which is not a high rate for electricity. Other costs for different fuels varies, with the cost of the fuel. But the real point is that you should NOT decide on whether to do it based on cost. You should do it because it is they right way to heat. Use the cost to choose the best system but don't let that be a show stopper. Just think of how much money you spend on things with NO ROI !!! The list is endless, but you still buy them don't you??? Everyone on this planet has been brainwashed to look at the ROI as a GO / NO GO "switch" when it comes to RE.... And of course this has happened. After all, what else could the conventional fuels industry use as a "weapon" against a technology that is wonderful and clean by nature, literally. It is the only "weapon" they have and they have done a wonderful job infiltrating it into the "base" thinking of all Western society. Remember, just because RE has a ROI, it does NOT logically follow that it be a do or do not construct. It is a construct of selection within choices. Not the choice itself....

.....Bill

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Author: The other missing Solar Energy solution is Geothermal in

[William Bieganeck](#)

Date Posted:
[April 26, 2008](#)

Particular Geo-Exchange. Geo-Exchange encompasses the entire system and utilizes the earth (or a pond or lake) for both a heat source and a heat sink. Components of this system include a heat pump, a hydronic pump, a ground source heat exchanger typically Polyethylene Pipe buried horizontally or vertically in the ground or laid in a pond or lake, and a distribution subsystem which could be radiant heating or cooling or forced air.

Geo-Exchange is available 7x24, is available everywhere unless you live on a rock and can provide heating and cooling with a much shorter ROI than other renewable energy solutions. The energy savings of Geo-Exchange compared to traditional methods of heating such as Propane and Oil can be as high as 75% according to the DOE. The efficiency of the systems are also much higher than other forms of heating. The Coefficient of Performance (COP) for a Geothermal Heat Pump is 3.5 compared to .95 for a high efficiency Natural Gas Furnace. A COP of 3.5 provides 3.5 units of heat for each unit of energy consumed.

Geothermal in particular Geo-Exchange is a sleeping giant.

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Author:
[Larry Weingarten](#)

Date Posted:
[April 26, 2008](#)

Hello Carolyn et all: Even though I've been involved in solar thermal since 1978, there are other things I'd suggest you look at before solar. There are "drain heat exchangers" that capture what would otherwise be wasted BTUs. GFX, Power Pipe and Retherm are three brands. In the May/June issue of Home Energy Magazine they are compared. "Structured plumbing" and "manifold plumbing" are two types of piping systems that can be far more energy and water efficient than conventional piping. Also, they deliver hot water much faster. Google "Gary Klein structured plumbing" for some interesting reading on plumbing design. Those two improvements could save as much heat from being lost as solar might add.

As for solar, when the big storage tank fails, it can be quite expensive to replace. This has caused many systems to be abandoned. Have a look at www.waterheaterrescue.com to learn how to maintain solar and other glass lined tanks. Solar collectors can freeze and burst, but as they are usually copper, are not hard to braze and make workable again. Pumps and controls fail also, encouraging one to design solar systems to be as simple as possible.

I agree with William Fitch that ROI is not a wonderful tool for looking at energy improvements. Life cycle cost seems more appropriate. As an example, look at how we insulate our buildings. They are designed to be cost effective the day they are built, but how about thirty years from now? If we knew the price of energy into the future, installing insulation that was cost effective half way through its life span, would be considered the

minimum acceptable amount to put in. Even without a crystal ball, we know energy prices will go up and ROI based on energy cost today begins to look silly.

Yours, Larry

Comment 20 of 31

Author:
[Carolyn L.](#)
 Date Posted:
[April 27, 2008](#)

I say that I have natural gas hot water and the first response to me ignores that and says "if your tank is electric". Well, it's not, so the response doesn't help me at all.

Okay, I'll buy that I'm using 64 gallons a day of hot water. Say I want to raise the temperature 70 degrees from 50F to 120F.

$64 \text{ gal/day} \times 8 \text{ lbs/gal} \times 70 \text{ degF} = 35840 \text{ BTU/day}$
 $\times 30 \text{ days/mo} = 1 \text{ million BTU/mo} = 10 \text{ therms/mo}$
 /.6 Energy factor (of my natural gas water heater)
 $= 16.7 \text{ therms/mo of NG needed to heat the water}$
 $\times \$1.20/\text{therm} = \$20/\text{month for hot water heating.}$

W.Fitch, you're right, not everything needs an ROI, but when people like Benjamin Gorman claim that solar thermal has a very brief payback, I look for it and am disappointed. His altestore says a system costs \$3K-\$6K and save 40%-80% on the water heating bill. You say people can spend \$20/month on water heating. That's probably about how much we spend.

$\$20/\text{mo} \times 80\% \text{ savings} = \$16/\text{mo or } \$192/\text{year savings}$
 $\$3000/(\$192/\text{yr}) = 15.6 \text{ yrs best case. (62 yrs worst case)}$

Larry, yes, those drain heat exchangers look neat. Unfortunately we have no basement, only a short crawl space. We don't have the 3 feet minimum vertical drop required.

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Author:
[William Fitch](#)
 Date Posted:
[April 27, 2008](#)

Hi CL:
 Sorry, missed the NG at the end... but as you noticed the amount came out the same... different energies tend to "level" themselves cost wise over time with short periods of exceptions....

I agree that allot of companies exaggerate claims.. but that is hardly unique to RE. Look at car ads.. If I were a young single guy I would think that I could have a different gorgeous companion every night!! All I have to do is spend 30K on those "energy technologically pathetic" four wheeled vehicles and I'm good to go!! Its always been buyer beware.... The Solar thermal DHW systems I design and put in (Evacs) always yield 90+% of the DHW load for the end user year round. I personally would not put in a solar DHW at 50% capacity generation... it wouldn't be worth the cost..I.E. you don't have to spend that much more to go over 90%...

Regarding conservation, of course it comes first... drain water recapture is not that great because when it works the best is when the hot water is being sent down the drain AT THE SAME TIME, as it is being "drawn". This

sets up a counter flow heat exchanger effect. Showers are good for this, baths NOT etc... As for manifolding, well, I personally like series insulated copper pipe. You have to remember the two main reasons contractors DO ANYTHING is speed and cost. They can put in a PEX manifold system far cheaper and faster (which really means cheaper too) than soldering copper pipe with less chance of first time leaks between feed and use points. If you are curious about what I do you can visit my web at WeAreSolar.com. I don't usually mention that because I think when you say that something is your business it strips "truth" from your offerings. I have only been into solar as a business for about 5 years but have been "doing" solar and RE for over 30 years if that's any counter-balance.

Comment 22 of 31

Author:
[Chip Harvey](#)
 Date Posted:
[April 29, 2008](#)

Note to Gary Tulie post 4/25;

Love the great info on this subject. The efficiency of solar thermal is intriguing, simple, and low cost. Of course, needing a storage tank makes it harder for large volume, but in the case of swimming pools, our tank is built in. And using energy blankets in combo with solar gives us 150% more efficiency by saving about 70% of evaporative heat loss from idle pools at night. When solar thermal gets even more efficient, you bet we will reinvest in it again. And maybe wind and geothermal.

Thanks for all the other ideas. 1) Heat recovery ventilation costs more than it saves in our mild climate in Atlanta, plus it creates mold and bacteria issues in the long ductwork we need for airflow management of chloramines. Air quality and chloramine destruction are what pools are all about, but so far heat recovery has been uneconomical. 2) Water-to-water heat exchangers were too expensive to retrofit and saved only a very small amount. In pools, swimmers are not big shower users, plus we installed low flow, temperature-regulated, and timers. 3) Waterless urinals - we have them. Plus low flow sink faucets with auto sensors, and we are retrofitting low flow toilets. 4) Natural light - we have no windows by design in a competitive pool where it causes water glare which interferes with officials judging swimmers' strokes. Necessary sacrifice. 5) Evaporative swamp coolers work in Arizona, but not Georgia due to low and high humidity levels respectively in each climate.

Using energy blankets also cut our water consumption by 51% annually from 9 million gallons to 4.4 million gallons, saving \$27,000 per year for water and \$10,000 in chemicals. Our pools (heat storage reservoirs) hold just under 2 million gallons, so heavy use and evaporation are the culprits (we check for leaks constantly). The water conservation has been very important to us having had an historical drought the past couple of years.

Comment 23 of 31

Author:
[Steven Gorman](#)
 Date Posted:
[April 30, 2008](#)

All these comments on thermal solar are focused on gadgets, like DHW systems. Did everybody miss her point? My house in Virginia costs only 1/3 as much as my neighbors to heat, and I have no gadgets, just passive solar design and insulated shutters. With a few tweaks, I think I can lower that even more. But the cost is that I have to open my windows on sunny days, and close them manually on cloudy days and at night.

I tried to convince my county environmental council that just siting a house correctly can save 15% or more on heating and cooling, even without any gadgets or passive solar design. (more with passive solar design and gadgets). They couldn't comprehend the concept.

Perhaps somebody needs to write an article on "Solar Energy: It's not just gadgets."

Comment 24 of 31

Author:
[Carolyn L.](#)
 Date Posted:
[April 30, 2008](#)

Her point was heating, not electricity, and her gadget is the SolarWall(tm), which I am considering (or a similar product), but I live in a mild climate, and spend more money on heating hot water than on heating the house, so it's not a high priority for me. I prefer your idea over hers... passive solar design, rather than gadgets. But there's a limit to how much one can do to an existing house. Cooling is more of an issue for me, so we put in retractable awnings over our south-facing windows and a solar attic fan in our roof.

Comment 25 of 31

Author:
[William Fitch](#)
 Date Posted:
[May 1, 2008](#)

Hi last two comments:
 No one missed any points here... I just put up a warehouse with all passive heating and cooling in PA... but I don't need DHW... If I did the evacs would be on there... passive is great but it doesn't do DHW.. especially in cold climates.. as far as space heating goes, both active and passive should be used to get to net zero energy use, with just the non thermal electric load left for PV and or wind..... you can tell how most of the comments here are still hung up on ROI rather than just the simple idea that it RE is the right way do do it instead of the wrong way with conventionals....

Comment 26 of 31

Author:
[Andy Olsen](#)
 Date Posted:
[May 1, 2008](#)

I appreciate the point the author makes and agree that space heating is overlooked, but I disagree with the paragraph ending with this statement:

"the reader can automatically see wherein the problem lies with having a one-track focus on electricity reduction."

I'm not so sure. Consider that a) many homes are heated with fuels that have lower carbon emissions per BTU than coal and b) many natural gas boilers operate at higher efficiencies than coal power plants.

It's a good point that bears penciling out a bit further to

see what's what.

Comment 27 of 31

Author:
[Carolyn L.](#)
Date Posted:
[May 6, 2008](#)

W. F.,
Again, yes, ROI is not everything. Unfortunately I'm not made of money, so I prefer to go first for the things (like our PV system) which have a positive ROI and things like the awnings, which do not give a positive monetary return, but do give a decent return in terms of added comfort (considering how high I set our thermostat in the summer). Unfortunately solar DHW has neither of those benefits for us at this time and so is on the list of projects to consider doing later.

Comment 28 of 31

Author:
[Benjamin Gorman](#)
Date Posted:
[May 26, 2008](#)

Carolyn,
A bit late with this (I wasn't monitoring this thread), but here goes:

Lest I came off as a salesman with an agenda (I'm not in sales, but in education), for an analysis of DHW payback, please don't take my word for it. Read Bob Ramlow's book, *Solar Water Heating: A Comprehensive Guide...* (New Society Publ. 2006), particularly the chapter about financials. If included in the cost of the mortgage (not your case), DHW systems pay for themselves even before first use! And produce positive cash flow. But he offers a more cogent discussion of the almighty ROI than I can do here.

Yes, he's a biased party (solar thermal designer/installer), but I'd guess that many/most of us making a living with RE are doing so first because we believe in it, and somewhat later because we think it's profitable. Not always, true, but I will speak for myself on that count: True!

I'm surprised that your calcs for your PV system beat DHW, but then you're in CA, where the rebates are best in the nation at present. Have you calculated the rebates into your DHW system? Not in the above, you didn't. Let's be fair, now! You will get a federal tax credit of up \$2,000 for a qualifying PV AND DHW systems. Yes, BOTH separately. AND you can qualify for the CA \$1,500 rebate for DHW. You also get a property tax credit, and quite possibly incentives from your local utility. Did you not know this? See www.dsireusa.org for information. So if you're going to compare PV to DHW, you must include or exclude rebates for both systems to be fair.

Sadly, the available tax credits and rebates are the only things that keep RE afloat. If it weren't for those, most folks wouldn't use the technologies because, as William Fitch says, we've been trained to look at everything in dollars (and not sense). I hope you find a way to justify the expense for SOME DHW system. It's vastly more efficient than your gas heater.

Comment 29 of 31

Author:
[Benjamin Gorman](#)
Date Posted:
[May 26, 2008](#)

Following on Wm. Fitch's comments:

If ROI, as measured in the cost of offset traditional energies, is the only way we "justify" RE technologies, no change will happen until it's far too late (\$300-400/bbl. oil?). There MUST be an emergent "green economics" that can be applied to the consumer scale in order to make the numbers look favorable, even if the rationale mind already knows the right thing to do.

We routinely ignore, for example, the outrageous inefficiency of our distributed (electrical) power system: coal-burning power plants (~50% of our nation's electricity supply comes from burning coal) are typically about 35% efficient; then the power is transported through the grid where 50% or more of it can be lost in transit! If our thinking only goes out as far as our own meters, we're pretty much doomed, given the coming peak oil crisis.

The true cost of our energy is not reflected in the highly subsidized prices we pay for our fossil fuels. Surely any rational approach to energy economics must include the health and environmental costs. How bizarre (but, given our history, understandable) that these increasingly obvious costs are simply ignored. (Maybe if we ignore them they'll just go away.)

Comment 30 of 31

Author:
[Carolyn L.](#)
Date Posted:
[May 27, 2008](#)

Benjamin,

No, I did not include the \$2K Federal tax credit in my above calculations. From looking at costs for buying systems on the internet and comparing it to costs that installers quote for installed systems, I figure the \$2K tax credit would roughly offset the installation costs which I also did not include in my above calculations.

I don't count a property tax credit as a savings. I see it as an avoided cost (since I wouldn't pay extra property tax on a new non-solar DHW system either). I did not include the CA solar hot water rebate because it is not yet available in my area. As I mentioned above, when the details on it finally come out, I will consider solar DHW again. By then, the cost of natural gas may have gone up more, making solar look more favorable

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