

“Top 10 Ways to Save Money While Making Your Home Green”

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Introduction

Why this guidebook?

I am guessing that if you are reading this guidebook that then you are you interested in making your home more efficient, comfortable and healthy. First of all, my congratulations in getting to this point, many people have no idea and no interest in learning how make their home more green. If you’ve already done some research then you probably discovered that there’s overwhelming and sometimes contradicting information about what’s most important and where you should spend your money.

I have been in the residential energy efficiency field for over 12 years and I am still trying to figure it out myself!

Over the past years I have spent a lot of time researching and learning on the job. The field of energy efficiency and green building is evolving rapidly and there is always new information and products. But, I have found that some of the key opportunities for greening a home are well-known and applicable to most homes. Once I waded my way through all of the information and misinformation, I found that there are some questions and issues that come to the top of the list. At Advanced Home Energy, I also found that these questions come up over and over with our clients. And so I thought it was time to share this information with the world in the hopes of helping more people move to action.

This guidebook is not a broad overview of all the ways to save energy in your home. I have chosen to cover specific questions/answers that are most frequently overlooked or misunderstood by homeowners. I also have not provided information on how to go about *doing* the work. If you are ready to move to action but are not the do-it-yourself type person, then I encourage you to contact my company for more information on our construction services.

Does solar power make sense for my home?

Whether solar makes sense for your home depends on your reasons for doing it. Is it a financial decision? Environmental? Moral? Something else? I can address the question of whether it makes financial sense, and I'll debate the other reasons another day.

The first thing you need to understand is that the financial return of solar is typically at the bottom of the list compared to other energy projects. Solar panels are expensive compared to reducing consumption in the first place. But with all the press and exposure over the past 10 years around solar, solar has remained a coveted home improvement. And so, many people want it. Fair enough. The good news is that there is a way to install solar so that it makes better financial sense than the typical system installed by solar companies. If that's true, why don't they tell you about it?

The reason: the bigger the installed system, the more solar installers get paid.

Sorry if that sounds so obvious that it feels facetious. But I think it's an important issue, because I have yet to encounter a solar company that is seriously talking efficiency with clients in order to reduce their solar system size. Dollar for kilowatt, solar usually costs 2-3x more than efficiency so our philosophy is: first reduce consumption through efficiency measures and second install a smaller solar system that is sized to an energy efficient home. The end result will be a much better return on investment, improved comfort, and a greater environmental impact. You don't have to just believe me, the numbers speak for themselves. Here's an example:

	3.5 kW Solar System	Efficiency	Efficiency and 2.6 kW Solar
Gross Cost	\$28,000	\$8,000	\$29,000
Tax Credit	(\$8,400)	(\$1,500)	(\$7,800)
Rebates	(\$3,300)	(\$1,000)	(\$3,475)
Net Cost	\$16,300	\$5,500	\$17,725

Benefits	3.5 kW Solar System	Efficiency	Efficiency and 2.6 kW Solar
	<ul style="list-style-type: none"> • 73% Less Electricity • Peak Load Reduction 	<ul style="list-style-type: none"> • 25% Less Electricity • 54% Less Natural Gas • Improved Health and Comfort 	<ul style="list-style-type: none"> • 80% Less Electricity • 54% Less Natural Gas • Improved Health and Comfort • Peak Load Reduction

As you can see, in this example the net cost of efficiency with solar is slightly higher. The truth is that combining efficiency with solar sometimes costs the same and sometimes costs a little more. But one thing is certain, the payback is better because you reduce your electricity AND gas consumption; and you benefit from a more comfortable and healthy home.

Finally, one other point and then I can answer the question. If your utility is PG&E, then you are probably paying on a tiered rate. This means that the more electricity you consume, the more you pay per unit of electricity. For example, the lowest amount you could pay for a kWh (the equivalent of running ten 100 watt bulbs for an hour) is \$0.11. Whereas if you consume a lot of energy you would pay \$0.49 for the same kWh. If that doesn't make any sense to you, don't worry you're not alone. I honestly don't know why they use such a confusing system. Regardless, the point is this: if you consume a large amount of electricity each month you are paying top dollar for your energy. In this case, the payback of a solar/efficiency system becomes quite good.

So, to finally answer the question: If your electric bills are above \$100, and the higher then the more this is true, then a solar system can make financial sense for your home. Of course, at the risk of beating the point to death, a solar/efficiency solution is THE best way to go.

The Great Fiberglass Scam

A highly respected energy consultant that works on national energy policy asked me the other day, "How do you convince people to install a green insulation product such as cellulose when installing fiberglass batts is so much cheaper?" I gave him the honest answer, "Actually, installing fiberglass batts is more expensive"

The reason for this is that in order to install fiberglass batts correctly, you cannot have any gaps or compression. In order to install batts you have to slow down and spend a lot more on labor time. The very few times I have seen fiberglass installed according to the correct standards, the installer stated that it would have been cheaper to install cellulose. Most installers don't bother with a quality installation and so the walls have enormous amounts of small missing areas at the edges, compression around wires and plumbing and

general voids. To a layperson the wall looks insulated; only once the homeowner has moved in and experienced an uncomfortable house are the implications of the cheap insulation job truly noticeable.

According to the California Energy Star Home Program the following are required for batt installation:

- Installation shall uniformly fill the cavity side-to-side, top-to-bottom, and front-to-back.
- Batt insulation shall be installed to fill the cavity and be in contact with the sheathing on the back and the wallboard on the front - no gaps or voids.
- Non-standard-width cavities shall be filled with batt insulation snugly fitted into the space without excessive compression.
- Batt insulation shall be cut to butt-fit around wiring and plumbing, or be split (delaminated) so that one layer can fit behind the wiring or plumbing, and one layer fit in front.

The implications of not following these procedures are dramatic. According to the Building Performance Institute (BPI) a batt installation will be rated as “Poor” if it has gaps over 5% of the insulated area (again, this is very common). A “Poor” rating means that an R-30 fiberglass batt will perform at an effective R-value of R-7. In other words, batts installed with 5% gaps are 77% less effective than their manufacturer claims.

The only way to effectively insulate walls is to be certain that they are completely filled without any voids. The only practical means of doing this is by using a blown-on product such as cellulose or foam.

How does My home’s consumption compare to the “typical” house?

Below is a graph for the average consumption in California for gas and electricity for different size houses. There are many factors that can be compared when looking at a home’s consumption: square footage, number of occupants, age of house, etc. All these variables make comparing one home to another very difficult without gathering a lot of information about the houses and normalizing the data using software.

What home improvements have the best bang-for-the-buck?

The only way to know this for certain is to conduct a home energy audit of the home which will tell you the breakdown of where you are spending your money. But, you can gather a lot of interesting information just by looking at your utility bills. This will help you determine the most likely issues. Then you can implement the changes and track your bills over time and see what kind of impact your effort made.

For example, as I mentioned above, most PG&E utility customers pay a tiered rate. The first question to ask is which tier are you in? See diagram 1 below for a client of ours that was in the top tier. Next, look at your consumption over the year and determine how much is your average year-round consumption (we call this your baseline) for lighting, water heating, refrigeration, etc. and how much is your consumption for heating and cooling. You can do this by plotting the consumption for each month on a graph. Diagram 2 below shows an example; note the yellow line which is the baseline. Once we have this charted it's simple to see where we have the greatest opportunity, on the items below the baseline or on the heating/cooling above the baseline.

What are the most common efficiency measures that you find most houses need?

First let me say the party line: every home is unique and we find that our recommendations for each home are unique. That said, after testing and doing work on hundreds of home I have found that there are several measures that we end up recommending in the vast majority of older homes we test:

1. Draft sealing
2. Improved attic insulation
3. Air duct sealing and balancing

What are the top Low-tech Solutions I can do Myself?

- Evolve Showerhead
- Turn down the water heater temperature
- Ditch the fridge in the garage
- Swap out regular bulbs for Compact Fluorescent Lights
- Install an automatic timer on the power strip attached to your entertainment system
- Have your furnace tuned-up once a year. Notice I didn't say change your furnace filter!

What you Really need to know about Wall Insulation

I have been out to many homes where we find that there is no wall insulation. It tends to be one of the more expensive items because it requires a lot of patching and painting in addition to the insulation cost. For that reason it tends to be lower on the priority list. However, it does make a big difference for comfort and sound, and sometimes it is the biggest culprit for energy loss. So sometimes we recommend wall insulation, and it breaks my heart when I learn that the homeowners just painted their house.

The point I want to make is that **the BEST time to insulate your walls is right before you paint.** It's an enormous lost opportunity to not insulate before painting.

Let me briefly tell you the benefit of wall insulation. We've done wall insulation for many clients that rave about how much more comfortable their house feels. But it's one

thing to hear from others, and another thing to experience something yourself. I insulated the walls of my own home in Berkeley which is located on a noisy street. Sure enough I was amazed by the difference. The reduction in my heating bills was nice, but the biggest benefit by far was the reduction in noise and the increased comfort of our home.

When wall insulation is done correctly there are a minimum of 2 holes in each 16” bay. Of ten times there is fire blocking and other blocking that requires more holes to fill all the little sections. We find that on average we are installing 3 holes for each bay. The end effect is that your wall looks a little like Swiss cheese by the time we’re done. But, that’s a good thing, because it means that the entire wall was insulated and there are no missing pockets.

Complete coverage of the wall is crucial for the insulation to work well. Heat, like electricity and water, follows the path of least resistance. If you insulate 95% of your wall and leave 5% uninsulated then where do you think the heat is going to go? It doesn’t uniformly transfer through the wall, but migrates through the cold spot. It’s like a bowl of water with a tiny crack at the bottom, the water will leak, right? Heat loss through a gap in your wall insulation will work the same.

If that makes sense to you then maybe you’re thinking: I get that complete coverage is very important, but how do you know you are filling all of wall? You can’t see inside a closed wall, so you are really guessing anyway. Well, would you believe me if I told you I can see inside a wall?

The correct way to insulate a wall is to use an infrared (IR) camera to check your work. We use the IR camera to look at the wall and we can see clearly where the crew missed pockets or where the insulation is not well packed. It took us some trial and error to figure out how to integrate the IR camera with our work...it's not something someone normally done by insulation contractors. But I know it works, and I’ve seen the result of not doing this. When we are called in for an energy audit we scan walls that have been insulated. The other companies don’t use IR cameras and they miss areas every time. Typically, they install 2 lines of holes and ignore all the cross bracing that leaves uninsulated pockets (see images below)



Typical Wall Drilling – 2 holes per bay



Using the IR camera we found that 2 bays

needed 5 holes for complete coverage



IR camera can see hot/cold spots in walls

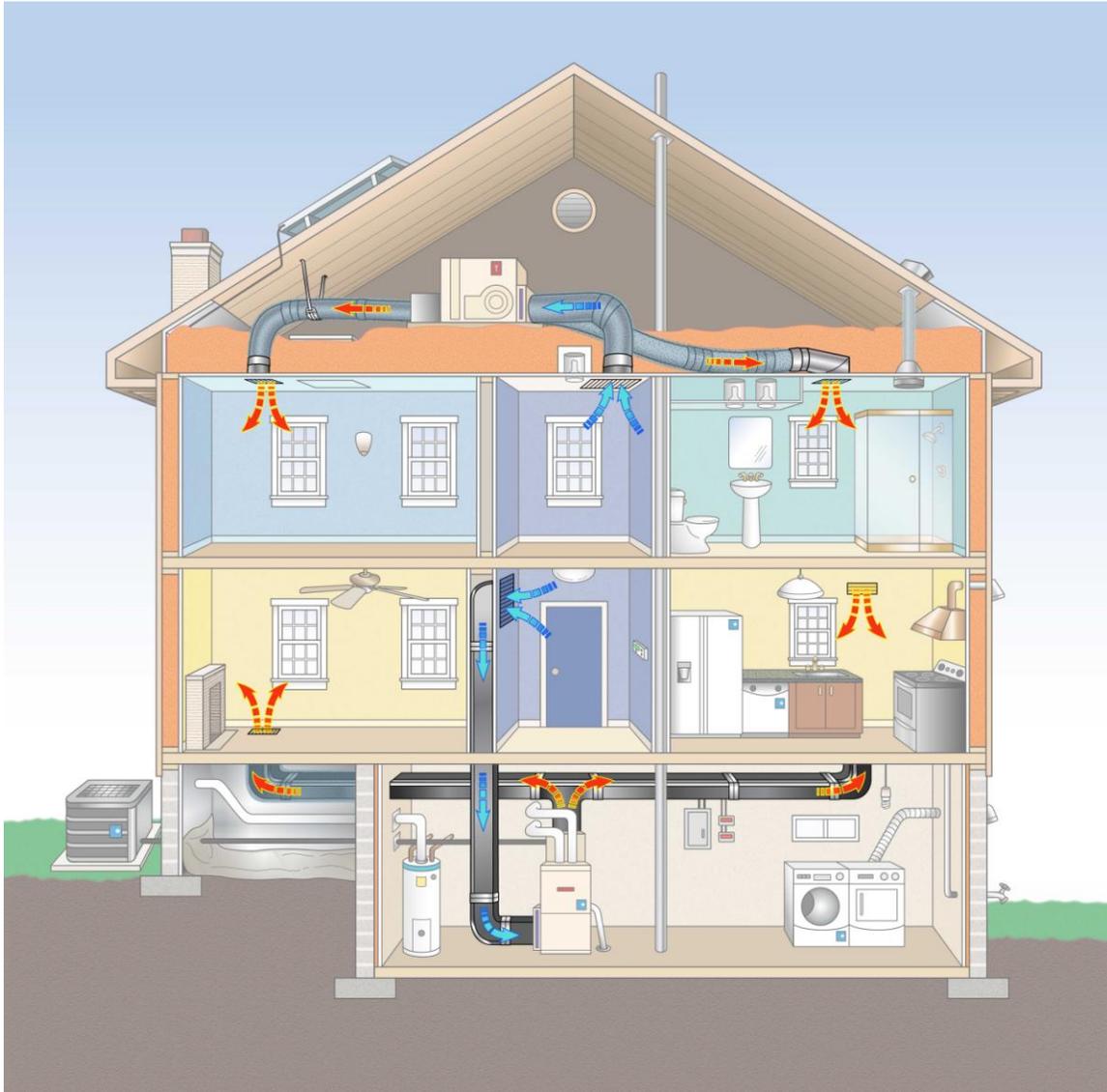
IR image showing a pocket in the wall that didn't get insulated.

When using the IR camera, we know that our work will take longer. Sometimes it can take us twice as long as the other guys, because they are missing almost 50% of the wall. They will tell you that they will insulate the entire wall, but ask them to guarantee it and see what they say! Remember, if they're insulating 95% of the wall (and that's being generous based on the jobs I've seen) then you will be losing a lot of energy. If they are insulating only 75% of the wall (we see this all of the time) then your money is definitely better spent on other efficiency efforts.

Does it make sense for me to upgrade my heating and cooling system?

HVAC technology has improved dramatically over the past 15 years. Many older homes have furnaces that are 50-80% efficient compared with 96% efficiency available today. That is a big difference, but it doesn't tell the whole story! Here's a little dirty secret: usually it's not in the HVAC contractor's self interest to tell you this information because they make their biggest profit by selling shiny new furnaces.

First, lets look at how an HVAC system works.



The furnace is the heart of the system and the ducts are the arteries. Installing a brand new furnace and attaching it to a failing duct system is a horrible idea. Yet, HVAC guys do this every day because they make a lot more money spending one day on swapping out an old furnace than spending three days replacing the duct system. Not to mention, a new furnace looks impressive, while a new duct system looks...well, not a whole lot different. So the duct system often gets neglected. As a result, the home owner ultimately pays for this in higher operating cost for heating and cooling and decreased comfort.

Let's lift the veil and show you the impact that a poor duct system can have. In the homes we have tested over the years we have found that duct systems in older home in the Bay Area leak an average of 30-40%. That's like throwing away \$0.40 for every dollar you spend on heating!

But don't just believe our findings, let's see what the experts say.

According to PG&E: "If your ducts are leaking, expensive conditioned air is spilling into your attic, crawlspace and other unoccupied areas. In fact, as much as 50% of the energy you spend on heating and cooling can be wasted this way."ⁱ

According to The U.S. Dept. of Energy: "You can lose up to 60% of your heated air before it reaches the register if your ducts aren't insulated and they travel through unheated spaces such as the attic or crawlspace."ⁱⁱ

The fact is, ducts are an integral part of your heating/cooling system. You can't receive the benefits of a high efficiency furnaces and A/C system without having a sealed and efficient duct system.

To swap out an old furnace takes about one day and usually has a very nice mark-up. Most typical HVAC contractors will replace the furnace and give the ducts a glance simply to ensure there are no very obvious issues. At Advanced Home Energy we take a much more comprehensive approach to duct systems. Unlike most HVAC general contractors, we "walk the ducts". This means we examine every inch of your duct system tracing it from the furnace to all the rooms. This confirms your entire duct system has been evaluated. We can then design the most efficient system tailored to the unique nature of your home.

Here at Advanced Home Energy, we take special care to design and install duct systems that sealed to provide maximum efficiency. Our toolbox for professional duct work incorporates the latest innovations in building science. This includes high quality duct sealing products like RCD Mastics, the latest in wireflex ducting, and Aprilaire whole house filters. By applying the latest advances in building science to your home, we ensure that you are making the most sound investment in the comfort, efficiency and safety of your home.

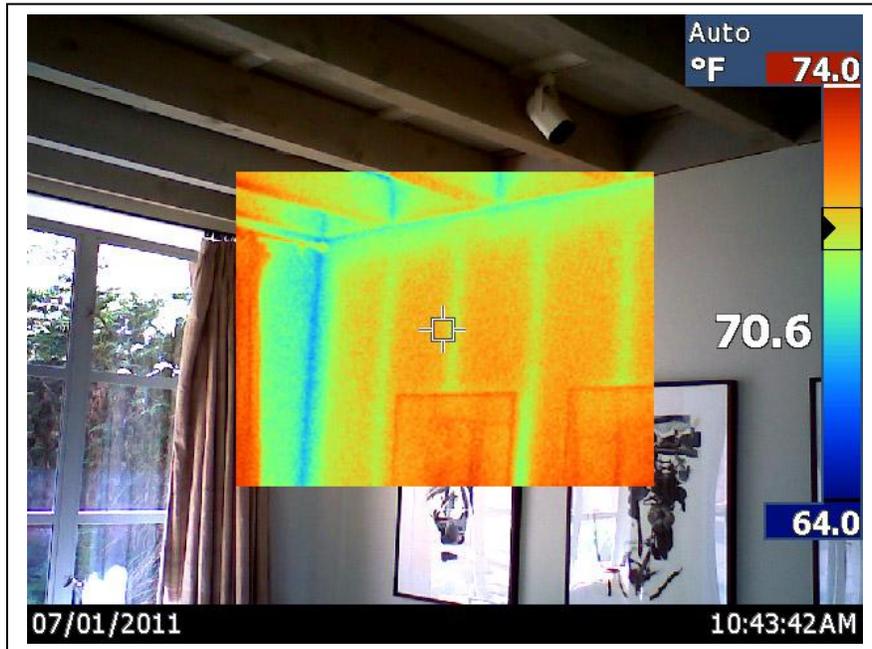
I want to improve my home's efficiency but I'm not sure what to do. Should I get an Energy Audit?

Yes. Professional home energy audits are the first step in analyzing your home's energy performance. This begins the process of creating an energy savings plan custom tailored to the unique needs of your home.

There could be hundreds of small places where your home is losing heating and cooling without your knowledge. When added up, it could significantly increase the time your furnace or air conditioner is running and your house still may not be comfortable. Hence a home energy audit is very important to cost-conscious and energy-conscious home owners. With a home energy audit, a professional can quickly and scientifically identify

the areas that are most cost effective for improving the energy efficiency, comfort, and health of the home.

A home performance professional will use a blower door test, duct sealing inspections, an infrared camera to identify the areas of greatest leakage and more to diagnose your home's efficiency. Here is how an infrared camera can reveal gaps in insulation:



With so many potential areas for heat loss, getting a hand up on winter can be time consuming. With a home energy audit, you can rest assured that a professional will seal your house and catch all of the areas that you won't. Your bills will be lower and your home will feel much more comfortable.

ⁱ Home Weatherization Fact Sheet: "What's Wrong with this Picture?" PG&E 1998

ⁱⁱ <http://www.energysavers.gov/tips/ducts.cfm?print>