

# Tips for Building a Successful Solar-Electric Home

Kirk Bailey -- 2/1/2017  
Illustrations by Bruce Osen  
www.abundantsolar.com

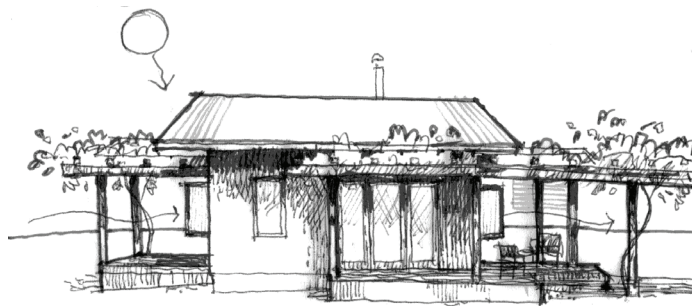
Are you interested in powering your new home with the Sun? Do you want a super energy-efficient house with a smaller carbon footprint and lower power bills - for life? If so, here are some ways to help ensure the success of your project.

## Big Picture Stuff

The most important thing you can do to make a residential solar-electric project a success is to work hard to make sure your new home will require as little ongoing energy as possible. A carefully crafted smaller home, designed with the local climate in mind, can be more comfortable to live in and use less energy to build and operate than the business-as-usual alternative - not to mention usually costing less to build! Along the same lines, if your budget forces you to choose between doing a GREAT job on weatherizing and insulating the building "shell", or installing a solar-electric system - spend the money on the building. You can install a solar system later, but you only get one shot at the building! [In our area this is sometimes described as making sure you eat your "conservation vegetables" before you have your "solar dessert"]

### Questions to ask your Architect or Contractor:

- Are there any ways that we can reduce the size of the house by designing it so that the internal space is used more efficiently?
- Is the house and landscaping designed and oriented to take maximum advantage of "passive solar" principles to help reduce long term energy requirements? Can the house take full advantage of prevailing weather patterns? [For example, capturing late afternoon summer breezes for cooling]



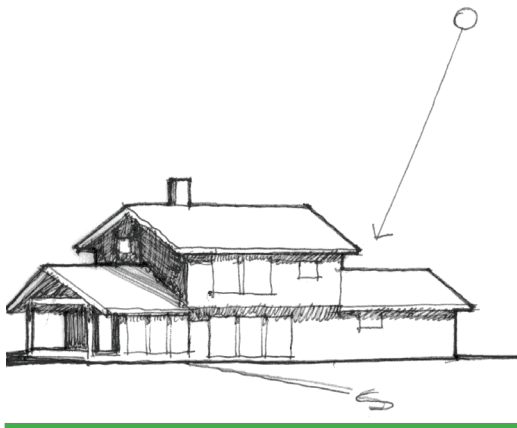
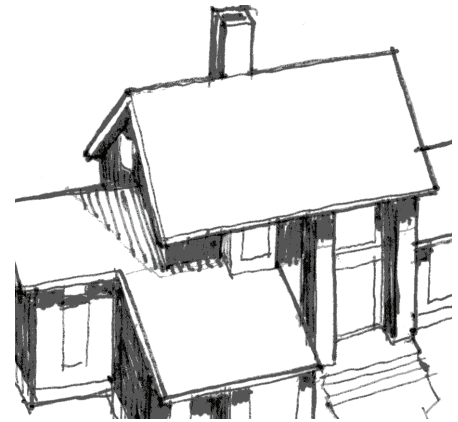
- What are the proposed insulation methods for the floors, walls, and ceilings, and how do they compare with the recommendations for our area?
- If my home will be "stick-built", are we adding rigid insulation or some other method to stop "energy leaks" through the studs in the walls? [Wood is a very poor insulator!]
- How are the floors, walls, and ceilings (and required penetrations), sealed to prevent energy loss from air movement? Does the design include a Heat/Energy Recovery Ventilator (HRV/ERV), to ensure that we get plenty of fresh air in our well-sealed home?
- Given a quality job of sealing and insulation, the windows and doors are usually the biggest remaining energy losers. What are the ratings of the ones we are using, and should we use better ones? [For example, triple pane R-5 windows are now readily available locally, although most new construction still uses double pane units]

- Now that we have a super-energy efficient building “shell”, how are we heating and cooling it? Are there more efficient options that might work well for our home? Are we taking full advantage of energy efficient lighting and appliance options?

- Finally, how are we testing the completed home to make sure we have achieved our energy efficiency goals? [Blower Door test for air-leakage, Thermal Camera check for missing insulation, etc]

## Solar Array Mounting Considerations

If you intend to mount a solar-electric system on the house roof, make sure you have a large-enough area of open roof space to install the desired “array”! It currently takes 50-75 sq ft of available roof space per kW of solar-electric panels. Generally, long “straight” rows of panels allow more efficient use of the available roof space and are easier and less expensive to install (and often look better), than scattering panels here and there on small “hips” and “gables.”



In the Northern hemisphere, having the array point South is best, but if you have to go with an West or East-facing roof the array will normally work better if the roof “pitch” is shallower than what is ideal for a South-facing array. [However, make sure that the panel mounting pitch is steep enough that they will “self clean” - panel manufacturer SolarWorld, for example, recommends at least ~10 degrees - but we prefer 15]

Shade is THE killer for solar-electric systems - for best results make sure that the array isn’t shaded by other parts of the structure or the surrounding environment (trees, adjacent structures, etc). And ideally, arrange the design so that required plumbing vents and other roof penetrations - especially chimneys - are located somewhere else!



### **A question for your Architect or Contractor:**

- Do you have experience with designing homes that work well with solar-electric systems, or do we have a local solar professional available to help review the design at the conceptual stage to make sure it will work as intended?

## **Sweating The Details**

- Consider pre-wiring the house for solar during construction, even if you aren't going to install the system immediately. It is much easier to install conduit before the walls are closed up with drywall!
- If you are thinking about installing an electrical backup system for power failures, have your electrician separate out your circuits into those that you need during an outage (the "critical loads"), and the rest. Then install the "critical loads" onto a separate breaker panel fed from the "main" panel, but which can also be powered by a generator or battery-backed-up solar electric system when necessary. Splitting your loads in this manner is easy to do during construction, but a pain later. [Critical loads usually include a well pump (if necessary), refrigeration, electric power for a gas furnace (if necessary), and a couple of strategically chosen light fixtures and wall outlets - only the things that are absolutely necessary to get through an outage]
- If you are planning on using a metal roof for your new home, consider installing one whose construction incorporates a "vertical standing seam". This can allow you to mount a solar-electric system on the roof by simply clamping to the vertical seams - no roof penetrations required!
- If you are using composition shingles instead, and will be adding the system soon, consider having the array mounting system installed when the roof is installed. This allows maximum flexibility when choosing which attachment system to use.
- And while we are discussing roofs, please note that steep roofs take longer and cost more to install solar on. Steep metal roofing can be especially difficult to safely traverse - avoid slopes over 5/12! Installing permanent safety anchors on any steep roof is strongly recommended to help make future array installation (or any roof activity), easier.
- Space: the final frontier in your new home! When it comes to a solar-electric system you need to make sure that you also provide space for the required non-roof equipment. Generally this includes one or more "solar inverters" and associated monitoring equipment, but depending on your system it could also include a fossil-fueled generator and/or a battery bank. [Location notes: Solar Inverters can often be mounted on either an interior or exterior wall, but if you mount them outside keep them out of direct sunlight - the cooler they run, the longer they last. Generators are normally mounted outside, while batteries prefer to be indoors where they can be insulated from large temperature swings. Also keep in mind that wherever you install batteries needs to be readily accessible - they tend to be large and heavy!]

### **Questions to ask your Architect or Contractor:**

- Is our chosen solar-electric sub-contractor certified by a locally or nationally recognized organization to ensure they are familiar with designing safe and effective systems? [Some State and Utility "incentive programs" also require this]
- Have we had the solar-electric contractor review the house plans and provide feedback on the design and installation details? [Doing this as early as possible in the design process can save lots of time and money down the road and result in a better performing system]

## **To Learn More**

<http://energy.gov/energysaver/energy-efficient-home-design>  
[https://en.wikipedia.org/wiki/Sustainable\\_architecture](https://en.wikipedia.org/wiki/Sustainable_architecture)  
<http://www.homepower.com/home-efficiency/design-construction>  
<http://www.greenbuildingadvisor.com/>