THE ULTIMATE GUIDE TO NET ZERO HOME CONSTRUCTION

Prudent Living®
BECAUSE IT'S TIME

Table of Contents

Introduction

Our staff at Prudent Living Homes developed this resource as a guide to better help you understand the amazing benefits to owning a net zero home and to answer questi

We believe net zero is not a new trend, but a new norm for residential living. This new way of building requires a blend of both proven and new construction practices along with the incorporation of technology. We hope that by the time you get to the end of this e-book you’ll have a much better understanding of what it takes to achieve net zero. Please don’t hesitate to contact us. We’re here to help!

Paul Biebel

President - Biebel Builders Inc. and Prudent Living Inc.

Chapter 1: What is "Net Zero" Energy Construction?

A net zero home is unlike any other home. In short, a net zero home generates as much energy as it consumes on an annual basis.

That may sound simple enough on paper but to truly achieve net zero, a series of mathematical and design steps need to be carefully implemented.

Step #1:

The first step when designing a net zero home is to determine the most cost-effective approach to achieving the maximum thermal performance of the house. This must come first, and synchronizing important design criteria is key. And let's face it. The process of building your dream house will, at times, involve some pretty strong emotions and opinions.

For example, who wants a net zero home that faces in one direction (perhaps to accommodate solar?) when the absolute best view may be in another direction? You've been told that a roof has to face south to incorporate solar panels, right? The floorplan of a well-designed net zero home doesn't have to be ugly on the outside, or force you to endure dysfunctional interior flow, or deny you that view of the lake, mountain, or pastoral countryside (...a view that may have been acquired at a significant premium).

Net zero homes can be of any architectural flavor without sacrificing either the outside appearance or the internal function and flow. Net zero does require a focus on science and math to achieve optimal electrical, heating, and cooling loads. With the correct calculations and design, you'll be able to eliminate utility bills, and elevate the quality of your home's interior at the same time. Sound like a good deal? It is!

Step #2:

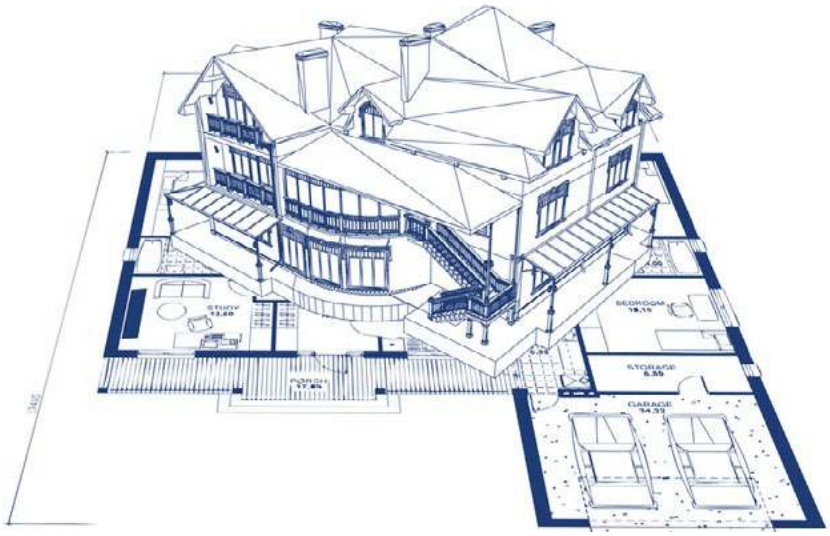
The second step when designing a net zero home is to minimize the size of the solar array that will be required to generate enough electricity to offset the consumption of energy. This part is pretty easy to determine once we have optimized the thermal performance and electrical demands of the house. v

Building a net zero home involves more than just the installation of solar panels on a house to offset the total annual energy consumption of a home. First, we strive to implement the highest performing thermal design strategies so we can keep electrical, heating, and cooling loads at their lowest consumption.

Net zero homes always include solar PV. But they also include geothermal energy when practical. The majority of them utilize "cold climate heat pumps" as their primary source of heating and cooling. Other energy-conserving design features may include heat pump electric water heaters; superior-insulated foundations, exterior walls and roofs; high performance windows; LED lighting; whole house air exchange systems; and Energy Star appliances.

Many people considering net zero home construction are interested in both practicality and simplicity. But any home built to high performance building standards, regardless of design, can ultimately become net zero with inclusion of renewable energy components. Net zero is a prudent construction choice for homeowners motivated by personal economy and a desire to properly steward the earth's resources.

Chapter 2: What is the Net Zero Energy Home Design Process?



Creating a Home Design

Net zero energy home designs begin with a dialogue between the client, designer, and builder. At first introduction, prospective clients often bring sketches, pictures, and a wish list with them. An experienced builder is able to clarify a client's ideas and offer plans or suggestions based on past experience. For example, if accessibility is important to the client, the builder might suggest floor plans that include a large first floor with master bedroom, with a smaller second floor designed for guests.

Identify Essential Spaces

A second step involves recognizing and labeling the essential living spaces. A home offering maximum efficiency reduces the amount of un-lived-in space, such as under-eave storage areas, breezeways, higher ceilings and unfinished basements. By recognizing these spaces as optional, the builder and client can work to maximize useable space.

Line-Item Essential Options

A third step is to identify non-essential options that can significantly increase both cost and energy use in a home, such as fireplaces, decorative woodwork, saunas, whirlpool baths, walk-in closets, and larger windows. A client may choose to add some of these later, but keeping these as separate budget items will allow the builder and client to focus primarily on controlling the overall energy use and base price of the home.

Recognize True Costs of Infrastructure

Most homeowners today are not satisfied with standard code electrical wiring. Whether you want a man cave, under-cabinet lights, tray ceilings, heated towel bars, recessed lights, or landscaping lights, you will want to identify with the builder the real costs of these features and keep them separated from the baseline budget. Experienced builders will assist you with deciding which options matter most. For example, you may decide to invest in radiant heating to melt snow and ice on your roof, driveways, and walkways because that will make your home safer as you get older. On the other hand, you may decide that a full-house vacuum isn't really necessary.

Consider Low Maintenance Options

A net zero builder might encourage you to consider the cost of maintenance in your deliberation. For instance, wood is often considered to be the highest quality material for the outside of a home. However, vinyl siding is not only cheaper to install, it offers excellent insulation and lower installation costs and because it requires no painting, it is easy to maintain.

Common Misperceptions of Net Zero

Because net zero homes are high-performance homes, they cost a little more to build. Yet the additional up-front cost can provide a return that begins as soon as you flip on the power switch. And the return continues to pay you back as long as you live in the home. Aside from initial cost, it's difficult to discern any other real objection to choosing net zero over conventional construction. However, net zero is a newer concept and open to misperceptions, such as:

A net zero home design is typically smaller

than that found in conventional home construction. A net zero home can be built in any size you chose. As with any conventional home, HVAC (heating, ventilating, and air conditioning) systems need to be sized to match the needs of the home, but there are no limitations to size. In fact some very large and prominent commercial buildings have achieved net zero energy.

A net zero home looks odd

A decade ago, solar panels lining a roof might have seemed unusual, but installations today are quite common and are likely to become more so in the future. Ironically, in the not too distant future, a new house that does not integrate solar energy into its design may be considered the odd home on the street.

Net zero homes are stuffy because they're too tight

Yes, these homes are tight. This contributes to the home's energy efficiency. It's also why net zero homes are always equipped with an air exchange system that introduces tempered fresh air while minimizing heat loss. With such systems in place, net zero homes provide a healthier indoor environment than exists in conventionally-constructed homes.

Net zero homes can't keep up in below-zero weather

Many net zero/high performance homes have a backup system (usually electric or gas) to carry the home through any short stretch of extreme cold conditions. Experience shows that these systems get very little use (regardless of prevailing sub-zero temperatures). Fact is, a net zero home is so well insulated, the home is unlikely to know just how cold it is outdoors!

FYI: All heating and cooling mechanical systems are designed to satisfy the needs of "minimal energy code compliant" homes, including the ones used in net zero construction. Although we calculate much lower heating and cooling loads for a net zero home, we use the same geothermal and cold climate heat pumps, which only come on 'when asked'. Net zero homes rarely 'ask' cold climate heat pumps to operate because the homes are so airtight and well-insulated, and retain interior temperatures so much longer than a minimal code-compliant home. So, a net zero home wouldn't necessarily know that the outdoor temperatures have dipped frighteningly low for some time period.

Chapter 3: Critical Elements to Achieving a Net Zero Home

Let's take a deeper look at what it takes to construct a net zero home. While a fully integrated design-and-build approach is key to success, it also requires a construction crew that cares about the "what" and the "why" of high performance building. Here, critical elements include:

1. Air-Sealing the Building Envelope

When a building is sealed, interior warm air cannot escape to the outside, and exterior cold air cannot get inside the home. Living in a cold climate like New England, it's essential to make sure that a home is air-sealed against winter weather. Typical 2006 and older homes leak between 25-50 percent of all energy used to heat them. Even in warmer weather, a sealed building envelope is important for keeping unwanted allergens, pollution, and dust out. Air leaks occur as a result of:

- Gaps in joints between building materials,
- Gaps around windows and doors,
- Pipe, wire, and duct penetrations between floors - basement to attic,
- Differences in pressure between inside and outside.

One of the best times to "leak test" the quality of the building envelope is before drywall is installed. This is done through a "blower door" fan (a specially designed high speed fan installed in one of the home's doors). Prior to running the fan, all doors and windows are closed. Other penetrations and holes in the exterior shell are temporarily sealed during this first test in order to get a good sense of how tight the shell is constructed. Penetrations would include such items as bath exhaust fans and intake holes for things like an air exchanger or gas fireplace or kitchen stove fan. Once all penetrations are sealed, the fan is turned on and pressure gauge observed - establishing how much resistance the house is offering against how much air the fan is trying to blow out. This creates a basis for comparison to readily available national data, and indicates how well the house is performing. When a high speed fan is blowing air out of a house, science suggests that the house will always replace that air with more air. The question isn't whether or not replacement air will find its way in, but: "How long will it take?" This is rated by "Ac/h" (air changes per hour). A "blower door" test will expose leaks in the shell and allow the builder to seal such leaks before covering the areas with drywall. Sometimes it's as simple as finding a wire that was drilled through the wall to install an exterior outlet or light. When the fan gauge is

holding steady at -50 pascals pressure, one can literally hear a leak whistling for the builder to come and seal it. It's fun to do this test and the typical crew will enjoy hearing test results, confirming that they have sealed everything. After the drywall is installed and the house is completely finished, we test again to see how much improvement has occurred. Usually, it's significant.

A good builder will perform a qualified "leak test" to ensure the envelope is properly sealed. Just as you wouldn't want any pipes in your plumbing to leak, it's just as important that your net zero home doesn't "leak" either.

2. Installing "Super Insulation"

An idea developed and refined since the 1973 oil embargo - the super-insulated house - made it possible to heat a home with minimal assistance, using traditional heating systems. Often, waste heat generated from appliances and body heat from home occupants adequately completed the mix. Super-insulated houses stay warm for much longer periods than minimally insulated houses, which is of critical importance during an unanticipated power outage. Super insulation is achieved with close attention to details, such as:

Use of higher R-rated materials. [An R-value is a measure of thermal resistance for a particular material or assembly of materials.] With super insulation, thicker walls are insulated to minimum R40, and roofs to R60. Houses built before 1973 had 3½" thick walls (the width of a 2x4), which were insulated with R11 fiberglass and roofs that used R19 fiberglass insulation. Both were standard construction at that time. It's accurate to say that a super-insulated home back in the 1970s used 2x6 (R19) walls with 9-12" of insulation in the attic (R30). It's likely that none of these homes had insulation under the slabs or around the foundation. A lot has changed since then. High performance homes built from 2010 onward have wood-framed walls with thickness that sometimes exceeds 12".(R45). Attic ceilings are sometimes insulated up to R90 and foundations have at least 2" of foam on both sides, and underneath each slab is a minimum of 2" insulation (with sometimes as much as 12" of foam underneath).

It is critical to ensure that no gaps exist in the insulation, especially where walls meet the roof, foundation, or other walls. Everything must be air-sealed. There's quite a science behind the "how" of air sealing, and this is where an inexperienced builder can really foul things up both for his client and also for himself. Not too many years ago, a three-year-old house in New Hampshire had to be torn down because the low bidder didn't pay any attention to the proper placement and installation of air and vapor barriers. He didn't understand the difference between closed cell and open cell construction or air tight construction in general. Consequently, within three years the house was full of mold. Condensation had accumulated in the cathedral ceilings and brought down the sheetrock. What was left hanging had turned black from mold. The walls showed high water marks with the same black splotches. The carpet had mushrooms growing in it. It was a beautiful house from 100 yards away, but the only way to fix it was to tear it down and rebuild.

3. Use of Insulated Windows and Doors

Windows and doors can leak heat to the outside, from their perimeters and directly through them. In fact, windows and doors are the primary source of lost heat. Net zero homes use doors and windows that offer the highest insulation values. Strategic placement of windows and doors is also important to energy efficiency through passive solar design. With passive solar design, the windows of the home will be oriented to maximize solar heat gain in the colder months and to minimize heat gain in summer. Again, it's important to achieve a balance between passive solar gains while not sacrificing the potential of a stunning view. A qualified net zero builder can help you work through these and other choices.

4. Reducing "Thermal Bridging"

Thermal bridges are connections between the inside of the house to the outside, without any break between them. Most of the time they are just studs or rafters or sills and rim joists, and so forth. That may not sound like much, but when you calculate the number of studs and rafters and the lineal footage of sill plates and rim joists that are telegraphing your heat directly through a stud and plywood to the outside, it can add up to a lot of flowing heat loss. This is called "conductive heat loss" because the heat that is lost is "conducted" through the material and not through the air. To remedy this issue, it's very important to separate the inside walls of the home from the outside with a "thermal break."

Many people think that insulation makes things warm. But in reality insulation doesn't make anything warm. The performance of insulation is a measure of how well it resists the transference of heat or cold through it. Refrigerators are insulated to keep the cold from getting out and the warmth from getting in. Houses are designed in a similar way, only we rarely think of a house fighting to keep the cold in … unless it's really hot out, of course. But in Northeast climates we usually think of heat as our dominant energy source and cooling as secondary. So the design and heating systems need to be geared for really cold climates.

Even with the highest value of insulation and best-insulated doors and windows, a home will lose heat if it is not built in such a way as to eliminate as much thermal bridging as possible. One way to do that is to space the studs further apart. Stud spacing at 24" apart will minimize thermal conductivity.

Because this facet of construction really does save energy, some houses are built with stud and rafter spacing at 32" on center and the cavity is then completely filled with closed cell foam insulation. When this material hardens, it's often stronger than the lumber.

One good way to overcome thermal bridging and minimize conductive heat loss is to add a layer of Styrofoam insulation over the studs on the entire outside of the house, covering over all the studs and their direct contact points with the outside. Another way to overcome conductive heat loss is to build a double stud wall. This is where the inside wall is completely disconnected from the outside wall. It is usually about 12" in total thickness and filled with dense pack cellulose insulation. When this system is used, there is no need for the Styrofoam insulation. This is a favorite system for those who are uncomfortable with using any foam products in their house as it gives a thermal performance of R45 and has no thermal conductivity through the framing members except at critical structural support points, which are very few.

5. Installing Energy-Efficient Lighting and Appliances

Technologies for energy efficiency in lighting and appliances have been rapidly advancing and costs have been lowered. LED lighting is now mainstream and cost-effective. When shopping for appliances, ENERGY STAR labels allow energy use to be compared; although some of the claims on those blue labels can't always be trusted. An ability to turn off energy consuming features, like heaters that dry dishes in dishwashers, can result in significant savings.

In small and mid-size houses, it is recommended that the primary water heater be a 50-gallon hybrid "heat pump" electric unit with a secondary standby 40-gallon electric unit, both of which should be able to be controlled manually. This has become a favorite option for homeowners, especially those who are rarely home during the day. A lighted switch may be located by the homeowner's primary door and be turned on and off when entering and leaving the home. Most water heaters will take only fifteen to twenty minutes to reheat when turned back on and the secondary unit can be activated when needed for additional users, or for filling a larger tub. At other times, the lighted switch is a reminder to turn off the water heaters when leaving home for extended periods of time; providing an opportunity for savings that can add up to hundreds of dollars a year. Vacation home owners especially value this feature.

Chapter 4: Heating and HVAC Systems for Net Zero Homes

The design of the heating and cooling systems in a net zero home is vital.

The "old school" way of sizing heating systems for a house was to compute the square footage and then multiply by forty. So if you had a 3,000 square foot house, then the HVAC contractor would install a 120,000 BTU furnace. But if that furnace happened to be oversized for the house, it would continually cycle (come on and go off) and quickly wear out.

The heating demands, for example, of a 3,000 square foot, high-performance house today is one-fourth what a house of this size called for in years past. Thus, you should never consider installing an "old school" boiler in any net zero home. There is simply no need to do so.

Enter "The Cold Climate Heat Pump"

A heat pump is a highly efficient form of "electric heat." It transfers thermal energy from the environment into your home using the physical properties of condensing refrigerant fluids. Because the heat pump doesn't produce heat, only transfers it, there is little energy used. Most of the energy that heats your home comes from the external environment. Heat pumps are the solution of choice for several reasons:

- They are three or four times as efficient in their use of electricity as standard electrical baseboard resistance heaters.
- They are also more cost-effective to operate than conventional heating systems that use carbon-based fuels.
- They cost about the same as central heating but offer cooling as well as heating for the same price. The need to install a fire-rated and sprinkled utility room or worry about carbon monoxide is eliminated.

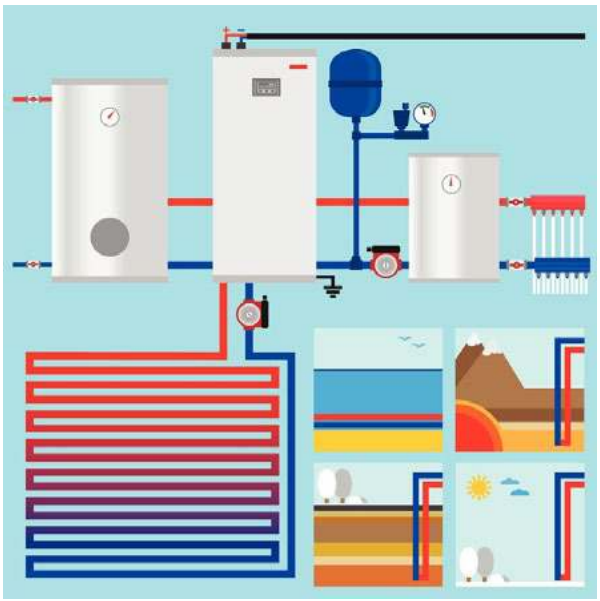
A gas stove, dryer, or fireplace still can be added as long as carbon monoxide detectors are installed. Instead of having just one, central heating system, every net zero home that is heated and cooled with cold climate heat

pumps is normally supplied with two or more condenser/pump systems mounted outside. Often, only one heat pump is necessary to maintain temperature in a high-performance house. So even if one of the condenser pumps develops a problem, there are at least one and sometimes two others that take over. Some heat pumps can be controlled online or by your smart phone. Gone will be the days where you had to pay a third-party monitoring company to keep tabs on your home. One fact to note: Heat pumps effectively heat and cool the space they are located in. While a strategically located and ducted HRV will "pull" some of the heat and cooling from one end of the house to the other, there is no question that bathrooms can feel colder than the rest of the house. A good solution is to either install an "on demand" electrically heated tile floor or a fan/lite/heater with a rather robust blower. Or you can install both. This has become a favorite choice and method of overcoming one of the challenges that may come with heat pump utilization.

Heat Recovery and Ventilation (HRV) Systems

Heat Recovery and Ventilation systems (HRV) cleverly use the reclaimed heat energy from outflowing stale air to warm the inflowing cold air as they pass each other by. The two channels of air aren't mixed, but they are designed to flow close enough to transfer heat. An HRV can reclaim up to 85 percent more energy than other HVAC systems. Moreover, HRV units have built-in air filters and the ability to control humidity in the home. This reduces indoor pollution, keeps homes more comfortable, and lessens the chance of mold and mildew. And as far as indoor air quality in air tight homes, it doesn't get any better than that.

An HRV is like a mechanical lung in a house that exhales stale germ-filled air and inhales fresh clean air. And when it does, it warms it up on the way in just like your body does. An HRV creates a controlled environment. It's way better than a home that "breathes" through leaky doors and windows. A home that "breathes" uncontrollably is a home that costs a lot to heat and cool.



Geo-Thermal Systems

Energy-efficient, cost-effective, and environmentally clean, geothermal heat systems can significantly reduce energy use and maintenance costs. Ground source heat pumps (GSHP) have one advantage over cold climate heat pumps. These systems have no equipment exposed to the outdoors and have a longer projected life before needing replacement. Electricity provided by solar panels (or from the normal grid, when necessary) is used only to move the heat, with circulator pumps, fans, and compressors. They are really just an elaborate form of electric heat, although this is rarely understood. Geo-thermal functions like a car with forward and reverse. If you want heat, you set the shift in one direction and if you want cooling you set it in the opposite direction. Typical geo-thermal systems use a heat pump and plastic pipes that are either buried in the ground or are installed in the same well that is used for domestic water. There are two types:

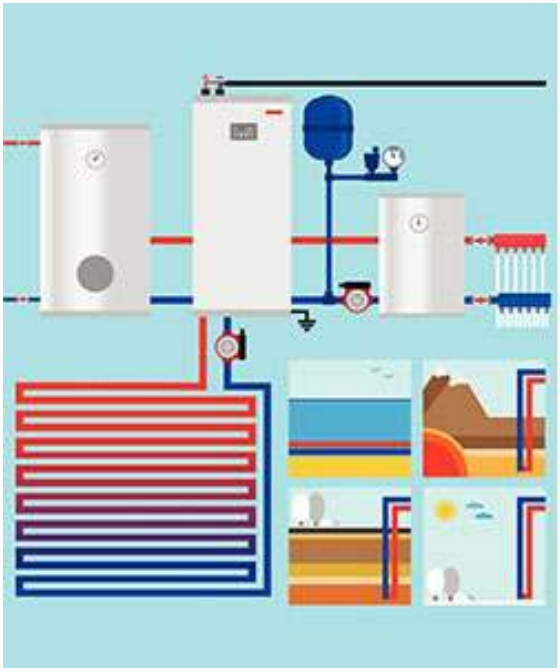
Open loop: Uses water fed through a pump and then put back in the ground. This is the least expensive to install because it usually shares space with the same well as the domestic water. One related disadvantage? If a well runs dry you not only lose your domestic supply but also the water that is needed for heating and

cooling. Also, a lightning strike to the well pump can dismantle the well system. When this happens, the system must be dismantled, pumped, reinstalled, sterilized, and given time for sediment to settle before it can be used again. This can take many days, only to have it happen again.

Closed loop: Circulates water and glycol solution and requires more drilling and longer pipes. This is more expensive to install but avoids problems associated with water use. One big disadvantage of geo-thermal systems is the amount of space they require for a free standing air handler and the insulated ductwork that is necessary to distribute the heating and cooling throughout the house. It takes a significant amount of space planning, both horizontally, and also between floors, for all the supply and return lines to be installed properly in heated and conditioned space.

Solar Hot Water Systems: How to Reduce Your Energy Bill by 20-40 Percent

Solar hot water systems (SHW) heat water in a chambered storage tank for use in your home. The size of the storage tank depends on the size needed by the family. In a solar hot water system, thermal collectors absorb energy and transfer it with a closed loop glycol system from a south facing roof or ground mount to the water in the storage tank. Generally, SHW relies on a back-up of a regular hot water heater. If the water in the storage tank is warm from the sun, then you will get solar heated water when you turn the tap. If the sun is not shining and the water in the tank is cold, the backup system will provide hot water. Generally, over the course of a year, SHW can provide 60 to 65 percent of hot water needs in northern climates. During the summer, your domestic hot water system usually requires no additional heating source. Water heaters consume 20-40 percent of the energy used by a typical family, so adding a solar hot water system can significantly reduce total energy use. SWH systems used to be a reasonable choice. As of late the cost of Solar Photovoltaic (PV) systems has come down dramatically. It has made more sense for many owners to install additional Solar PV panels in tandem with hybrid electric water heaters .This system saves several thousand dollars in cost while eliminating the added costs of maintaining glycol systems and pumps.



Chapter 5: Solar Power and Geo-Thermal

Solar panels are a key component in net zero homes. In fact, owners are unable to achieve a HERS [Home Energy Rater Score] rating of zero without them. These panels are usually placed on the roof, but can also be ground mounted or installed on poles (e.g. on a lawn, not on the house). Solar arrays can be landscaped into their surroundings, too. Only your budget and design preferences will determine where you place them. Solar power and heat pump technology go hand-in-hand to create the most cost-effective, environmentally-sensitive, and efficient design.

How Solar Panels Work

Light from the sun is made up of small particles called photons. A solar panel is made up of many small cells of positive and negatively charged silicon slices. When sunlight hits these cells, the photons knock loose electrons from the silicon atoms. That creates electricity. (Kudos to whoever figured that out!) However, that is only half of the job. The solar panel cells need to herd that electricity into a flow of energy. That happens because the positively charged silicon slices are sandwiched with a negatively charged slice of silicon, creating an electric field that causes the electricity created to flow into wires in the solar panel. This current is then directed through the wires to its destination.

Roof-Mounted Solar Panels and Building Orientation:

Careful placement of solar panels is vitally important in order to get the most energy production from them. Here are some things to remember:

- Unobstructed Roof: Solar arrays are at their best production when installed on a roof surface free of chimneys, vent pipes, dormers, or skylights that would prevent systematic arrangement of the panels. It is also important to ensure that no trees, poles, or other buildings will interfere with the sun hitting the solar panels because significant roof shading will impede the efficiency and production of the array.
- Roof Orientation: The orientation of the roof should provide for maximum exposure to sunlight. In northern latitudes, this would be within 15 degrees of true south.
- Roof Pitch: Generally, in Northern New England, a roof pitch between 35 to 45 degrees works best; but if you don't have it, there are other options to consider.

Grid-Tied Solar Photovoltaic System

Six components are needed in order to connect a solar array to the utility grid:

1. Solar panel array: The roof solar panels collect sunlight and convert it into direct current (DC).
2. Inverter: The DC power is run through an inverter to turn it into alternating current (AC) electrici-

ty.

3. AC Electric Panel: The AC current from the inverter is fed through an electric panel and backward through the electric house meter and out to the grid. Your house does not use all the power that your solar PV array produces. The utility company receives it and distributes it to other users, who pay for it.
4. Electric Loads: The home can only use the energy from the solar panels if there is a storage facility (batteries) which then distributes the power to the house as it calls for it. This used to be referred to as an "off-grid" house, but technology has advanced in such a way as to produce "bi-modal" systems that are capable of functioning as if they were totally "off the grid" or can function in the same manner as a "grid-tied" house that sends power back to the grid. Such systems will keep batteries charged for backup power when the grid goes down, but when the grid is functioning the solar array will send it back through the meter, essentially trading kilowatt for kilowatt.
5. A Net Meter: With a solar photovoltaic system, a net meter measures both what comes in from the grid as well as what is produced by the solar panels to be traded with the utility company. No money is exchanged. The trick is to not generate more power than you consume annually because most utility companies do not reimburse you. We believe this concept will change as more and more net zero homes are built.
6. Net Metering Compliant Power Company: Be sure to check with your utility company to verify their net metering plan, and whether there are any caps to the plan. A "cap" would limit the dollar amount of electricity they would trade during a certain period.

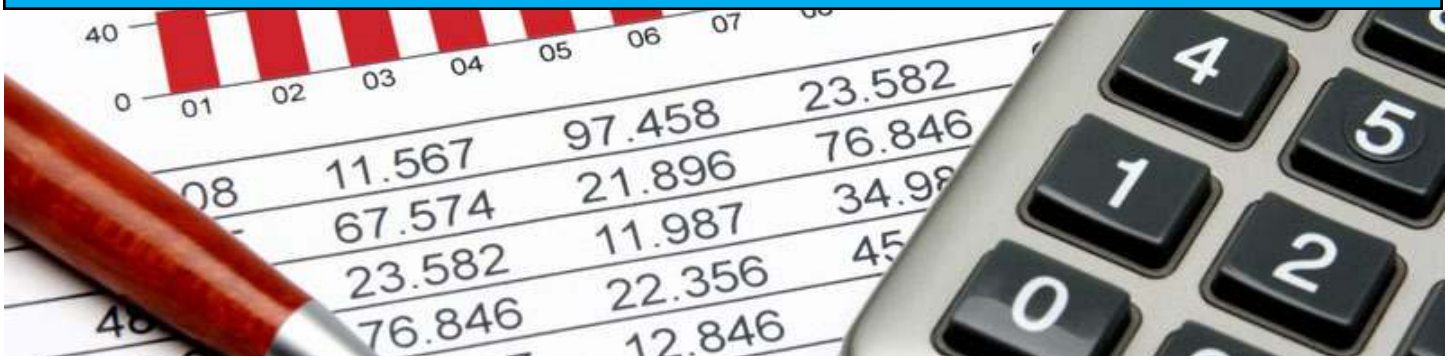
Energy Generation from Solar Panels

With proper installation and site, a 5 kW Solar PV roof system in Vermont or New Hampshire can be expected to generate about 6300 kWh each year, enough power to meet only the electric needs of a small home built to high energy efficiency standards. A high-performance home that utilizes cold climate heat pumps (mini-splits) for heating and cooling will require a larger PV system to ensure net zero results.

Is Net Zero Worth It?

For most folks, the net zero home is a proven and worthwhile investment because it allows them to:

- Predict Expenses: Utility bills are typically among the most significant costs of owning a home.



With a home that produces most or all of the energy it consumes, your utility costs won't fluctuate as a result of "out of your control" market factors.

- Maintain Lower Maintenance Requirements: One of the best aspects of heat pump and solar systems is that they require little maintenance. No more dirty furnaces to clean. No oil spills or automatic deliveries (that may not come until you 'automatically' call for an emergency fill-up and furnace restart.... typically happening in the middle of the night.
- Keep Systems Longer: Solar and geothermal systems typically last longer than traditional HVAC systems. That means you will enjoy indirect savings on annual maintenance, emergency repairs, and replacement costs. This may result in considerable savings over time.
- Protect Their Investment: A net zero home is built to higher performance standards. Because it is well protected from the elements and weather, it is built to last and hold its value. As more homes become maximized for energy efficiency, the value of homes which do not meet higher standards for energy efficiency will likely fall. Building to net zero standards now will help you protect your long term home investment.
- Pass on a Family Legacy: If you plan to pass your home on to family members, a net zero home may offer a better legacy from a financial standpoint. Additionally, a net zero home is a legacy of your values. Your home choice shows your concern for a prudent and controlled lifestyle, stewardship of the environment, and contribution back to the larger community.

Does Net Zero Make Sense Financially?

Absolutely. Net zero home construction may cost more, but anything you put into making your home more energy-efficient will pay you back in reduced energy bills, starting with the first month you move into your home. Better yet, this savings on your energy costs will continue month after month and year after year. In fact, it doesn't take long for a net zero home to not only repay the amount invested but to multiply the return on investment (ROI) through savings on your utilities. Most importantly, a net zero home protects you financially from potential high energy costs that may result from natural disasters or global economic changes.

Health Benefits of a Net Zero Home

With a net zero home, you will be providing your family with a comfortable and healthier environment, offering:

- Cleaner Air: Heat Recovery Ventilation (HRV) systems don't produce unhealthy fumes, so your home air is cleaner. An HRV system also filters to reduce allergens, creating superior air quality in your home.
- Quieter Home: With abundant insulation in the walls and roof, and triple-pane windows, your home is a tight envelope; much quieter and more serene.
- Consistent Comfortable Temperature: By eliminating air leaks, a net zero home maintains a more even temperature throughout the home, offering consistent heat and no drafts.

Net Zero Is a Responsible Choice

1. Net Zero is potentially "cash positive," meaning that the cost per month to cover the construction upgrade needed to achieve net zero (in contrast to a home built to meet minimum energy Code standards only) is less than the amount you'd pay for utilities. It just makes "cents" and banks are beginning to help fund these "cents"ible investments.

2. Net zero homes provide a built-in benefit that no other home can provide; peace of mind. Net zero homes broadly appeal to those looking to down size...or right size for this very reason. For those looking ahead to retirement, net zero homes have huge appeal because owners gain control over one of the least predicable future costs: utilities. For such individuals, the question may be: Why not cash in some stocks and reinvest in renewable energy...and build a net zero home sized for our future needs?

3. With a net zero home, you not only have a prudent and sustainable home for your own future but also prudently contribute to the betterment of the overall environment. And best of all, your choice of net zero speaks loudly to others of your values and prudent lifestyle...without speaking a single word.

NET ZERO SOLUTIONS

Take the first step and find out how to live more sustainably with a net zero home.

START HERE