Energy Review

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SUBJECT PROPERTY OF

CUSTOMER NAME

ADDRESS

VIRGINIA

WWW.ENERGYHOUSE.US

BEA Corp.

Property Description

Type of Home – Single Family

Lot Size –

Home Square Footage – Less than 3,000 sf +/-

Household – Family Members

City Services – Water, Septic, Gas, Cable, Phone, Elec,

Renovated Last – 2013 – Roof upgrade 5 years EST.

Planed Upgrades – Energy and Kitchen Renovation

Orientation – East to West – Tree Shaded – Back Roof Flat for Solar Array

Location – Arlington VA

Last Purchased – August 2012

Includes – 5 Bd, 4 Baths, Attached Garage

Yard – Very Large and fenced with pool

Home Built – 1977

Structure – Wood Framed – Wood Siding

Special – Installed Pool Solar Hot Water Array

Windows – All upgraded

LOCATION MAP

ENERGY HOUSE

Energy Review

This report is offered to our clients as a free introductory examination of a subject property in order to provide a starting point on its potential energy upgrade and its eventual new energy design

The Energy House has been an Energy Management Company since 2008 and in that time has overseen the study and upgrade of hundreds of homes in the great DC area.

The Energy House team is made up of more than 35 energy efficiency companies in the metro Washington DC that are committed to making your home, more comfortable, energy efficient, more sustainable and safer.

The systems that the Energy House includes in our

Energy Design is;

- Energy Monitoring
- Geothermal
- Passive Solar
- Active Solar
- High Efficiency Heating & Cooling
- Water Management
- Water Recovery
- Insulation
- Weatherization
- Lighting
- SMART Technologies
- Energy Evaluations (Audits)
- Energy Modeling
- Construction Management
- General Contracting

“Energy Design Begins on the Drawing Boards”

ENERGY STAR PARTNER

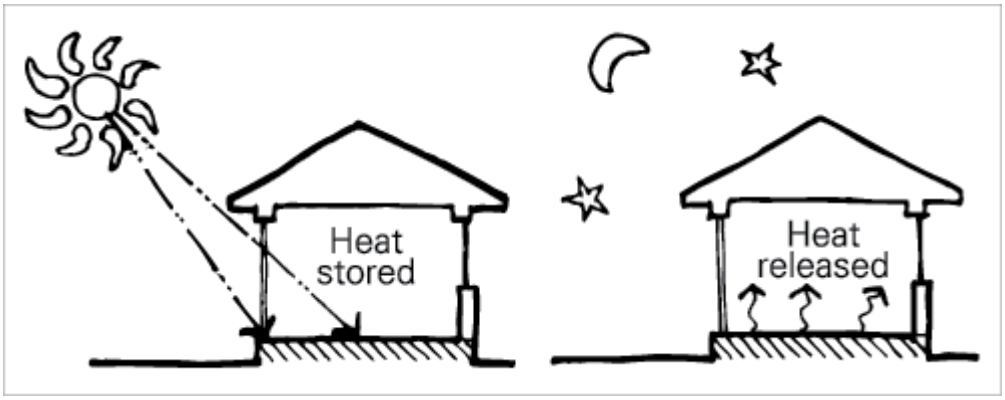
SUGGESTED EXTERIOR ENERGY UPGRADES

Overview

The basic existing building is in good condition. It is a very solid building and has very few open penatrations in the envelope. Areas of concern are as follows;

Passive Solar & Solar Thermal Space Heating

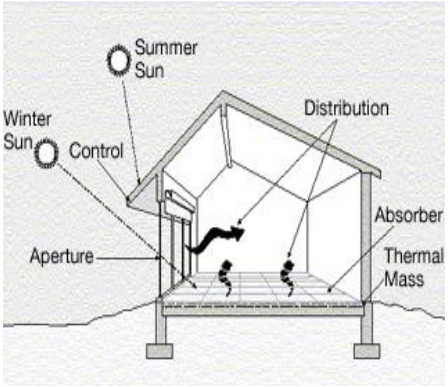
1. Passive Solar – Because VA is a heating dominated climate this is critical in saving energy that energy collection through passive solar be incorporated in the overall design or energy upgrade of any house being considered. Passive solar design takes advantage of a building's site, climate, and materials to minimize energy use.
2. Orientation – The proper orientation of a home would be always being toward the sun. This simple science has been practiced since the earliest civilizations and followed our own decedents across the frontiers of this country. Only with the advent of inexpensive heating fuels has this standard practice been abandoned and we now see our homes and buildings orientated to the street. Abandoning the free energy generated by the sun each and every day.
3. Design Makes A Difference - A well-designed passive solar home reduces heating and cooling loads through energy-efficiency strategies, which means lower heating and cooling costs. Using passive solar design to heat and cool your home can be both environmentally friendly and cost effective. In many cases, your heating costs can be reduced to less than half the cost of heating a typical home!

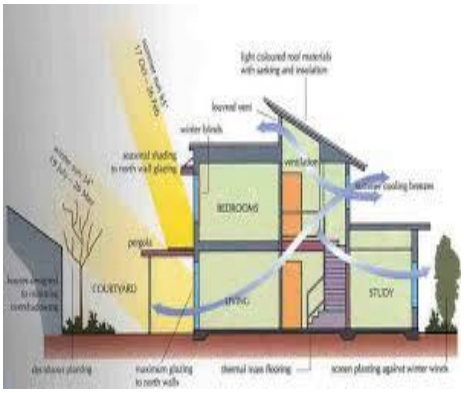


4. Free Heating & Reduced Cooling Systems - A passive solar home collects heat as the sun shines through south-facing windows and retains it in materials that store heat, known as thermal mass. Well-designed passive solar homes also provide daylight all year and comfort during the cooling season through carefully designed overhangs and reflective coatings on windows, exterior walls, and roofs.

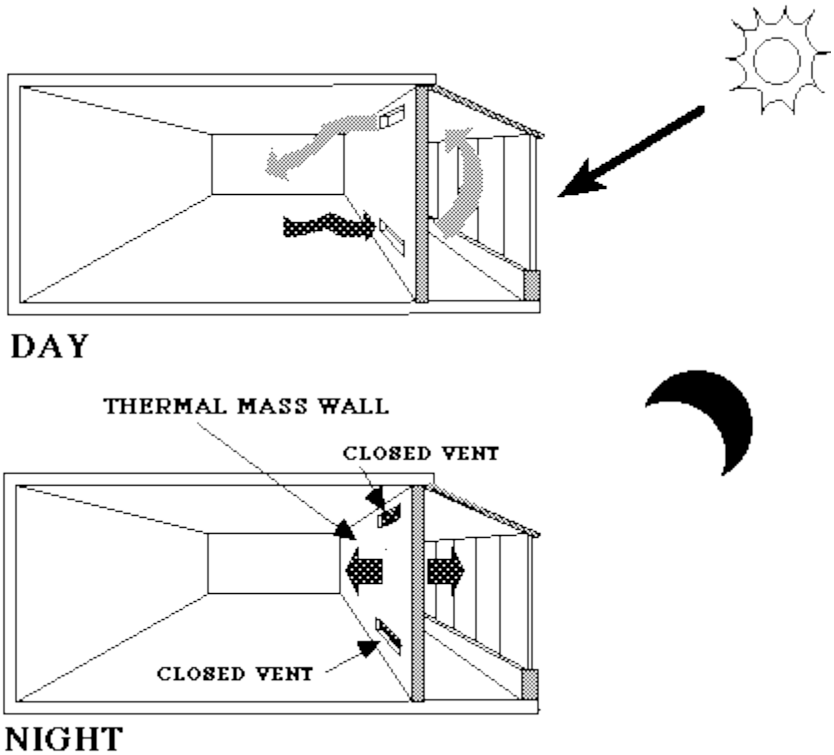
   To be effective, a passive solar home needs some basic elements that work together:

   a. Properly oriented windows
   b. Thermal mass
   c. Distribution mechanisms
   d. Control strategies.





5. General Window Glazing - This proper glass specification as well as proper shading and insulation of the windows could improve the homes operation of heating and cooling by 20%. Specific windows need solar glazing to take advantage of the sun while others on the north side need to be glazed to retain heating and cooling. A qualified window company needs to be included in the window specs to ensure these critical features are included in the design.
6. Solar Shades – Inclusion throughout the house would be very helpful in reflecting the heat away from the large amount of windows in the summer and allowing sun to flow into the house in the winter months. These shades need to be insulated and have a reflective layer into their design. They are more expensive than normal shades but if they are installed in a track or with the use of magnets they can also be used for security to keep people from looking into the house when they are drawn.



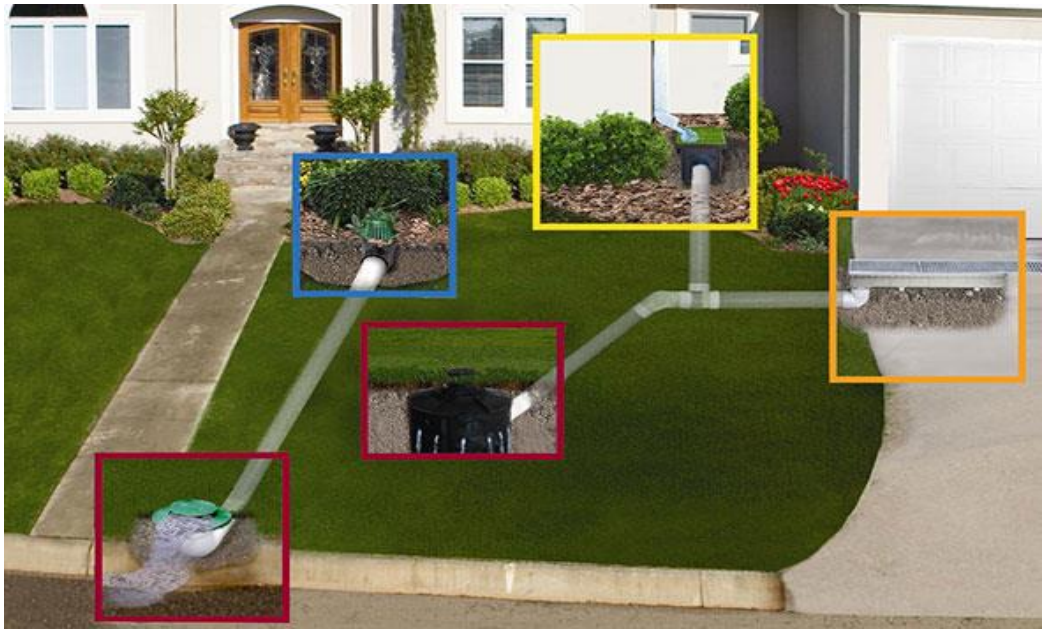
YOUR HOME – PASSIVE SOLAR

1. Solar Array - While the house has a flat roof on the rear of structure and it supports a non-functioning solar hot water system for the pool the lot is heavily shaded and with deciduous trees which will limit the solar gain to the house for that system in the summer months. An additional assessment should be done on the house and the solar hot water system to see how much life is left in the system and what the expense will be to make it work for the next 5 years. After that time the roof is in need of replacement and it needs to be determined if the solar hot water is worth removing and reinstalling after the new roof is installed.
2. Passive Solar – The house has passive solar gain in the winter months given its West facing rear exposures of windows and skylights. This is obvious from the solar screening that is on the rear kitchen bump-out. This is used to block the summer sun from overheating the kitchen area. While effective to reduce up to 80% of summer sun it is expected that the trees in the back yard provide adequate screening in the summer months to minimize the passive solar gain in the summer months. It is assumed that when the solar array was installed and the netting the tree were still growing and did not do the job they are capable of today.
3. Solar Shades – Exactly the opposite of what was intended, the amount of glass that has been included in the design of the rear spaces to capture winter sun needs to be protected in the evening times with solar shades on the inside of the house to retain that passive solar gain and to keep the warmth from the sun in the living areas. The same shades can then be used to control the summer sun if necessary. For example the netting on the kitchen window should be removed and solar shades install across the top of the window to improve the warmth in the kitchen. Solar shades can improve the R value of a window by more than double if the right shades are used.
4. Passive Solar Glass – Did not seem to be used on the passive solar collection side of the house. The label on the glass should be checked for Low E. Not the best glass for passive solar. On the north side of the house it is correct but not on the passive side.
5. Eastern Elevation – While some morning sun will enter the house each day the amount of glass on this face of the house needs to be protected from heat loss in the winter not as much as passive solar gain in the summer. Good natural shading is provided from the existing landscaping.
6. Modeling – It would be helpful to know how much passive gain the overall house is achieving and then see what the heat loss is in the windows and skylights during the evening times. It would be great to see how much savings there would be from insulted shades to the house. More on this in the modeling section of our report.
7. Solar Tubes – While not providing any energy efficiency or passive gain should be considered for parts of the house to provide natural lighting in dark areas that would not require electric lighting. This would be an energy savings from not having to use electricity when going up the central stairwell or passing through the second floor hallway.

Water Management

Saving, controling and managing water is becoming one of the most important functions for homes and business. As the cost of water escalates around the world concern for saving money from better water hardvesting and savings are on the top of the list for reducing costs.

1. Gutters – Make sure all gutters are in proper working condition. Gutter screens are highly recommended for most homes in the metro DC area due to the large amount of tree coverage that our communities tend to promote and require. In some areas of a home where large roof areas are being collected by the gutter system for rain, commercial gutters may be required (6 inch) This enlarge gutter will reduce overflow of the gutters down the side of the house and ensure the rain water is collected and discharged away from you foundation
2. Downspouts – It is recommended that all downspouts be designed to drain a minimum of 8 ft from the homes basement or crawl space walls
3. Walkways and Driveways – Should use permeable pavers to allow water to not run down the driveway or walkway toward the house but enable that same water to easily penetrate the soil and drain down beneath the pavers.
4. Drywells – In areas where clear daylighting of water away from the building is possible French drains or drywells should be incorporated into the water management design
5. Rain Barrels – Should be used to collect water and control its flow away from the home but also for plant and landscape watering around the house
6. Cisterns – For large landscaping, car washing, pool filling, and ponds underground cisterns can be incorporated into the water management design of a home
7. Low Flow Toilets – New water conservation toilets uses 1.7 gallons per flush compared to 7 gallons (Pre 2000 toilets) for traditional toilets. Cost of these toilets are higher than traditional but the retro-fit of existing toilets is highly recommended



YOUR HOME – WATER MANAGEMENT

1. Gutter Guards - The home currently has gutters and downspouts that are in working condition. Gutter screening should be included in their makeup because of all the leaves that will fall constantly onto the house from the surrounding trees. Gutter guards still require maintenance but not nearly as much as unprotected gutter systems.
2. Rain Barrels & Cistern – A water collection system should be considered for the house in order to provide water for landscaping but also for pool water refills.
   "On average, swimming pools lose about a quarter of an inch of water each day, yet variations in wind intensity, humidity, and sunlight can drastically change water loss rates." The addition of rain barrels can save water on deck and landscape watering. A cistern can be used to collect water off the roof and be reused for landscaping and filtered back through the pool system to replenish the pool water lost. Using city services to refill your pool can increase your water and sewer bill each month without you even being aware of the added costs.
3. Pool Leak Test - To tell whether you pool is leaking or just evaporating, set a bucket on your first or second step. Fill the bucket with water to the exact same level as the pool water that is outside of the bucket. Then wait a day or two to see if they go down at the same rate. If the pool level drops faster than the water level in the bucket, then you know you have a leak and it is time to call a leak detection company to find out where it is.
4. Rain Water Runoff – It was determined that a fair amount of moisture was seen in the living room crawl space from water running around the southern side of the house. In both corners of the crawl space the exterior wall showed they were wet.
5. Downspouts – Make sure the existing downspouts are working property around the house to shed the water away from the foundation. Animals will enter drain pipes that are covered with screening and nest in the pipes. This will back up the water onto the foundation. Leaves can also just clog the drain lines resulting in the same water backup. In the next rain storm go outside and watch the release of water through your drain lines to make sure they are shedding water properly. Water needs to be moved away from the house by more than 8 feet from the foundation.
6. Drainage – It was clear from the ER inspection that part of the water issue is from the side hill on the southern side of the house. Water running down off that hill is hitting the foundation and using it as a dam to then be redirected down the continued slope of the house. Landscaping can be used to raise that area next to the house to make sure the water is not hitting the foundation but is being shed away from the house as it runs off the hill from the side yard and the neighbor's driveway. French drains can be used to help the water in this area percolate into the ground faster as well.
7. Landscaping – French drains, planting beds, bark mulch and drainage swales are all recommended to eliminate the moisture in the crawl space under the living room. Our Energy House landscaping partner can be coordinated to come to the site and visit with the homeowner for additional ideas on water control.



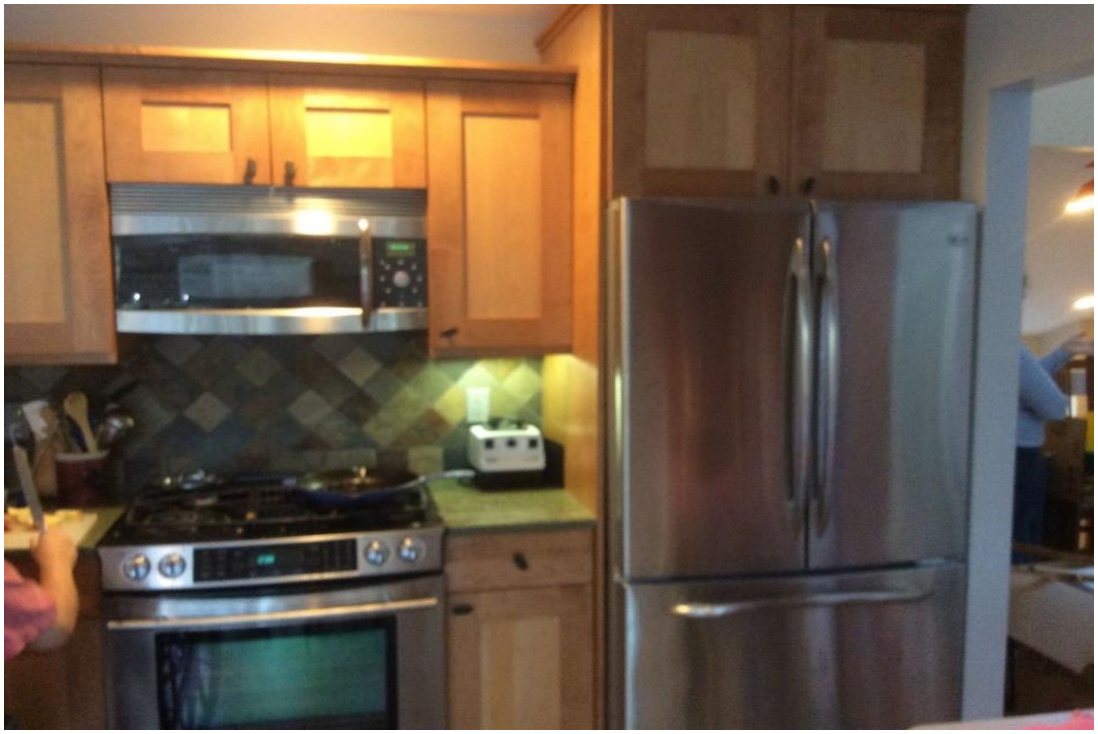
Energy Star

Energy Star *(trademarked ENERGY STAR) is an international standard for energy efficient consumer products originated in the United States of America. It was created in 1992 by the Environmental Protection Agency and the Department of Energy.[2] [3] since then, Australia, Canada, Japan, New Zealand, Taiwan and the European Union have adopted the program. Devices carrying the Energy Star service mark, such as computer products and peripherals, kitchen appliances, buildings and other products, generally use 20–30% less energy than required by federal standards.[4] In the United States, the Energy Star label is also shown on EnergyGuide appliance label of qualifying products.*

1. ENERGY STAR - Products are independently certified to save energy without sacrificing features or functionality. Saving energy helps prevent climate change. Look for the ENERGY STAR label to save money on your energy bills and help protect our environment.
2. Windows & Doors – Should be Energy Star certified as a means of saving energy now and long into the future on the investment that is made on these items. Replacing old windows with ENERGY STAR certified windows lowers household energy bills by an average of 12 percent nationwide. Lower energy consumption also reduces greenhouse gas emissions from power plants and shrinks a house's carbon footprint.
3. Appliances – In any upgrade of the home Energy Star appliances should be considered for any new purchase. In many locations there are tax incentives as provided to the homeowner by local municipalities and utilities.
4. Window and Door Install – It is recommended that Energy Star door and window installation specifications be adhered to in order to ensure the insulation integrity of the Energy Star product is not compromised with air leakage around the door or window
5. Cable Boxes - A "set-top box" is a cable, satellite, Internet Protocol or other device whose primary function is to receive television signals from a specific source and deliver them to a consumer display and/or recording device, such as a television or DVR.
6. ENERGY STAR qualified set-top boxes are on average 45 percent more efficient than conventional models. If all set-top boxes in the U.S. met ENERGY STAR requirements, consumer energy cost savings would grow to about $3 billion each year, reducing greenhouse gas emissions equivalent to those from about 3 million cars.
7. Televisions - New ENERGY STAR certified TVs save energy when they are off or on. The label can be found on standard size models all the way to large screen TVs. If all TVs sold in the U.S. were certified models, greenhouse gas savings would grow to 15 billion pounds per year.

YOUR HOME – ENERGY STAR

1. Appliances – In the Home Energy Evaluation that was supplied it mentioned that the refridgerator should be upgraded to an Energy Star appliance. This review did not check the appliances to make sure they were Energy Star grade.
2. Toilets – It was noticed that none of the toilets were duel flush. The existing fixtures can be easily converted to duel flush systems with retro fit flush valves. It is recommended to save on expensive city water and sewer fees.
3. Windows – Based on Energy Evaluation it is recommended that steps be taken to reduce the air infiltration found coming from around the windows. Proper Energy Star Window Installation Guidelines - See Weatherization section for additional action alternatives.
4. Modeling – As part of the process of this study and a proposed energy model that we will recommend be done on the subject property. It would be good for the homeowners to see what their carbon footprint is currently and what it will be reduced to with the inclusion of the proposed energy upgrades in their considerations.
   http://www.energystar.gov/ia/products/globalwarming/downloads/GoGreen_Activities%20508_compliant_small.pdf
5. Lighting Review – Have a full Energy House Lighting Review to determine what lights can be changed over to Energy Star LED or CFL types in order to save energy.
6. Cable Television Boxes – During this Energy Review it was not noticed if the home had cable television and if so what type of cable box is being used. Vintage cable boxes never turn off. Over the course of a year each uses about the same amoutn of electricity as a refirgerator. Energy Star cable boxes use much less electricity.



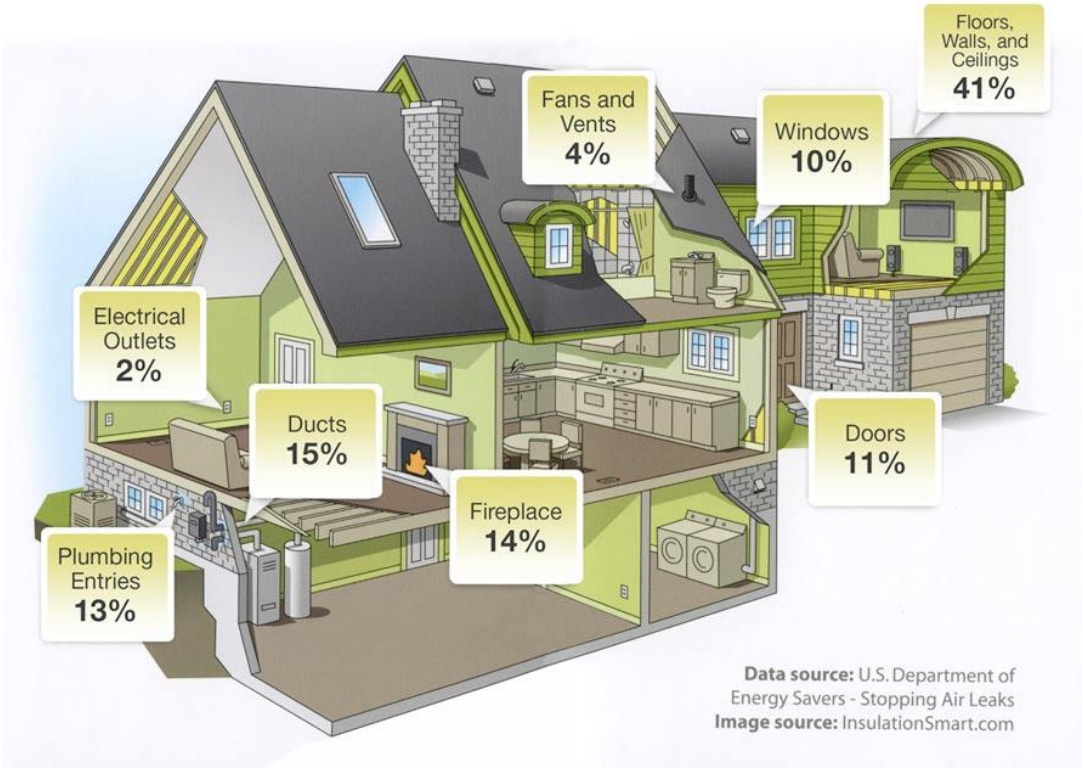
Air Sealing & Weatherization

1. Air Seal and Weatherize - All penatrations in the house for utilities and piping. These openings need to be found and identified in an Energy Evaluation in order to be insulated with foam and sealed. In addition any doors that are not replaced in the renovation should be weatherstripped and made as air tight as possible.
2. Weatherizing your windows
    a. Apply caulk around the outside edges of the window casing.
    b. If you have double-hung windows, open the bottom sash and install adhesive-backed foam weather-stripping to the tracks and to the bottom of the sash.

3. Weatherizing Your Doors
    a. Apply caulk to the outside edges of the door casing.
    b. Open the door and install weather-stripping to the inside of the doorjamb.
    c. If the door has a window, apply glazing or clear caulk to the edges of the windowpane.
    d. Stop under-door drafts with a rubber or vinyl door sweep along the bottom. In a pinch, a rolled-up towel can work too.
    e. Replace the threshold under the door with a flexible vinyl gasket. Look for an adjustable model that's easy to fit to the proper height.
    f. If you have a side or basement door you rarely use, seal the edges with removable rope caulk.

4. Other Areas to Weatherize
    a. Electrical outlets, especially along exterior walls, are a prime spot for cold air drafts.
    b. Carefully unscrew the cover and press a foam gasket around the sockets. Put the cover back on and insert childproof safety caps into all unused outlets.
    c. The attic opening is another drafty spot. Install insulation over the back of the attic door; if you have hatch-type access, add foam weather-stripping around the top edges of the openings.
    d. Wood fireplaces are notorious sources of air leaks. Tight-fitting glass doors are the best way to prevent air from escaping or entering. When you're not using the fireplace, keep the damper closed and close the glass doors tightly. If you never use the fireplace, plug the chimney with insulation and seal the doors shut with silicone caulk.
    e. The Chimney Balloon is the best product for stopping all drafts up a chimney that is on the market. When installed properly you can stop 98% of air leaks up the chimney

YOUR HOME – AIR SEALING & WEATHERIZATION



1. Exterior Penetrations - According to the Energy Evaluation there are a number of exterior openings that should be sealed. Exterior opening are usually utility penetrations and should be air sealed with insulation foam but then caped with concrete to keep small rodents out of the house. Additional air sealing of doors and openings as outlined in associated report need to be itemized in an overall Work Detail on a complete scope of exterior work.
2. Windows & Doors – Based on the thermal imaging that was done on the windows and doors in the Energy Evaluation, it was clear that when the new windows were installed they were not installed properly. It is therefore recommended that throughout the house the existing trim around the doors and windows be removed and then air sealed with non-expandable foam to insulate and air seal around the existing windows and doors. This is a simple process of removing the trim, air sealing around the unit and then returning the trim to the window or door ready for repainting.
3. Baseboard Second Floor – Before new flooring or carpet is installed remove the existing baseboard, air seal the framing plate to stop air infiltration from this area and then return the baseboard ready for repainting.

4. Rim Joists - In the basement area we did not see that the framed walls on the exterior foundation are insulated. While it would be hard to justify the removal of all the drywall to add this ridged foam insulation there is a justification to insulate and air seal the rim joists of the first floor that sit on the foundation. This is a major source of energy loss in a house (20%). While not recommended and missed in the Energy Evaluation the removal of 1 ft of drywall around the basement wall perimeter, then spray foaming the rim joists and returning the drywall ready for paint is highly recommended.
5. Garage Ceiling – It is recommended that all the drywall on the ceiling of the garage be removed so that area can be insulated and air sealed not only for warmth in the above rooms but also as a method of protecting the spaces above from gases coming out of the garage. At the same time that the drywall is removed the common wall of the garage to the conditioned space needs to be framed out to ensure that the ducts running along it are insulated and are inside that wall as part of the conditioned space as well.
   THEIR PICTURES HERE
6. Garage Drywall – Replace all drywall with new, tape and made ready for paint. It is not necessary to paint this drywall. Unfinished in the garage is probably more that acceptable.
7. Garage Doors – While the garage is considered non-conditioned space and while the garage doors are not insulated door weather-stripping should be installed to keep the air from freely blowing into the space. This will include a gasket at the bottom of each door as well.
8. Garage Door Into Home – Needs to be properly weather-stripped as well.
9. Crawls Space – A source of substantial amounts of cold and moist air coming into the house. The rim joists in this area need to be air sealed and insulated with foam to stop all air leaks in this area. Be sure to air seal all open grates from the outside that now provide venting.
10. Picture Frame – In all areas of the house where the framing has been exposed we recommend that the framing be air sealed with closed cell foam.



11. Air Seal All Attic Penetrations – Throughout the attic once the insulation is removed air seal all penetrations coming through the attic floor
12. Air Seal All Electrical Boxes – Where the electrical and switch boxes are exposed on exterior walls air seal around each box. Where electrical boxes are not exposed air seal around box and drywall.



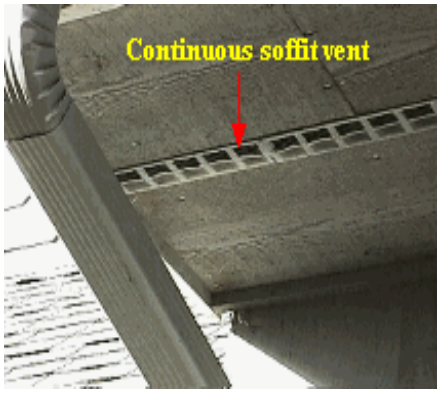

Insulation

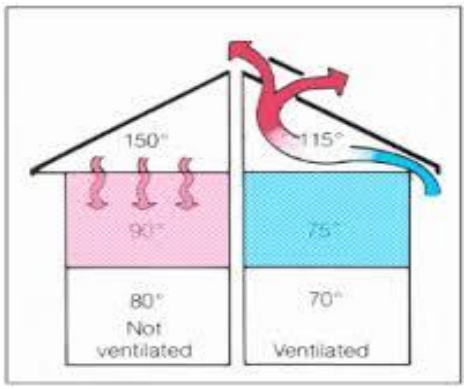
1. Insulation - You can reduce your home's heating and cooling costs through proper insulation and air sealing techniques. These techniques will also make your home more comfortable.
2. Insulation is made from a variety of materials, and it usually comes in four types: rolls and batts, loose-fill, rigid foam, and open and closed cell foam-in-place.
3. Use higher R-value insulation, such as spray foam, on exterior walls and in cathedral ceilings to get more insulation with less thickness.
4. Install attic air barriers such as wind baffles along the entire attic eave to help ensure proper airflow from the soffit to the attic. Ventilation helps with moisture control and reducing summer cooling bills, but don't ventilate your attic if you have insulation on the underside of the roof. Ask a qualified contractor for recommendations.
5. Be careful how close you place insulation next to a recessed light fixture—unless it is insulation contact (IC) rated—to avoid a fire hazard.
6. Fiberglass Insulation – While fiberglass insulation is in nearly every existing home in America. While prevalent in the marketplace the Energy House/BEA does not recommend the use of fiberglass in its energy upgrades if at all possible. There are many alternatives to fiberglass and where possible they should be included in a project.




YOUR HOME – INSULATION

1. Attic Insulation – It is recommended by this report and the Energy Evaluation that was done that all the existing cellulose insulation be removed from the existing attic floor. Removal of this old insulation will make it easy to air seal the attic floor. Then add R49 cellulose to the floor of the attic.
2. Attic Air Flow - It proposed that after the attic floor is open that air baffles be installed to establish the proper air flow through the space to vent the attic.





3. Sloped Ceiling Insulation Existing Conditions – Must of the sloped ceilings are covered in drywall and already have R19 fiberglass insulation in the framing already. The exposed framing that was observed looked to be 2 x 10 roof rafters which actually provide only 9.25 inches of depth. Code required in this area is R38. There are two considerations in this area, leave the existing drywall and insulate or leave the drywall and live with the existing insulation.
4. Sloped Ceiling Insulation Cellulose – Cellulose insulaton blown in with the dense packed system would provide you with a R 32. Removing the drywall, replacement of the fiberglass and then insulated with cellulose is a matter of cost and savings that can be considered after the modeling that is done on the home.
5. Sloped Ceiling Insulation Open Cell Foam - Removing the drywall then allows you to add open cell foam to the rafters which will air seal the roof area but will be more expensive 3 time than cellulose and only slightly better insulation levels.
6. Sloped Ceiling Insulation Closed Cell Foam – Removing the drywall then allows you to add closed cell foam which will double the insulation value but will increase in price by 5 times. The other problem is that with closed cell roof leaks will not be obvious as it does not allow water to penatrate it.
7. Foam Insulation – Air venting – it is now recommended by foam manafacturers that a home that has either open cell or closed cell insulation installed be allow to air vent for 24 hours without the homeowner in the house.
8. Sloped Ceiling Insulation – Combination – It is recommended that dense packed cellulose be used on all sloped roof spaces that are open already. In the front hallway it is recommended that

drywall be removed and insulated with cellulose as well. It is also proposed that foam picture framing being incorporated in all areas of the framing that are opened. This is being recommended because of the price and the efficiency of the product and the lack of controversey of the cellulose product now and over the history of cellulose since 1932.

9. Garage Ceiling Insulation – Add open cell spray foam in the ceiling of the garage to the level of R38. Return new drywall.


10. Crawl Space – Air seal and insulate rim joists in this area. Insulate all exterior walls with open cell foam. Install 20 mil plastic vapor barrier on ground to stop moisture and gases from entering the house. Air seal the edges of the vapor barrier.
11. Crawl Space Conditioning – At the end of the insulation and air sealing process it is important that the ducting in that space be opened just enough to provide a small amount of conditioned air to enter the space.


12. Plugs and Exterior Wall Switches – Install insulation pads on all exterior wall outlets and swtiches.

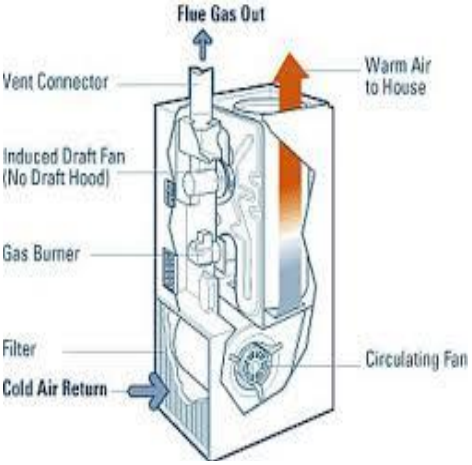
13. Exterior Cantiliver – Over garage the cantiliver in this area should be opened and spray foamed with open cell foam in order to stop all air infiltration into the bedroom spaces above.

MECHANICAL SYSTEMS



1. Overview – The mechanical system of an energy efficient home is the heart of the structure. The first step in making a home energy efficient is by properly sizing the systems that are providing the heating and cooling of your property. This requires looking at a structure holistically from weatherization, to insulation, water recovery, to the mechanical systems in a home.
2. Easier and Easier – Reducing your energy needs, reducing the amount of money that you are losing each and every day from an energy inefficient mechanical system in your home is a simple as proper energy design.
3. First Steps – As a method of determining what the best alternatives are for the mechanical systems in a home is to do an energy model of what is and what might be in the computer before any actions are taken. The collection of information needed to do this computer model can be done through this Energy Review and then with a more comprehensive Energy Evaluation. More on that in the sections on How to Get Started.
4. Mechanical Systems;
    f. Natural Gas and Electric Heat Pumps – This traditional type of heating and cooling will work very well in most homes that have access to natural gas or propane. 65% of the homes in the DC area are currently heated by natural gas. (SEER Ratings 14 to 21) According to industry standards gas systems are project a life expectancy of 12 to 15 years and the electric heat pump side of the system being less.
    g. Electric Heaters – Heat Pumps – Cooling – This system of using the outside air to exchange heating and cooling is another primary source of mechanical systems used in the DC area. With only 24% relying on only electric heating but more than 85% are using electric heat pumps to cool their homes. (SEER Ratings 19 to 22) According to industry standards these systems are project a life expectancy of 10 to 12 years.






Mini Split interior and exterior heating and cooling system. Used for zoned heating and cooling in specific spaces in the home.
http://energy.gov/energysaver/articles/ductless-mini-split-heat-pumps

h. Mini Split Heating & Cooling – This ductless system has dominated most of the world in the past 10 years. Almost all of the heating and cooling systems in Asia are ductless, a majority of the systems in Europe are already ductless, but in the United States it is projected that only 5% of the total market has embraced this highly efficient alternative for their homes.
i. Higher Energy Costs & Life Style – Are the reasons that the mini split alternatives have been slow to come to this country. While the mini split market is emerging the US it quickly growing due to increased costs and the increased demand for energy efficient systems by the general public. (SEER Ratings of 22 to 28) According to industry standards these systems are project a life expectancy of 12 to 15 years.



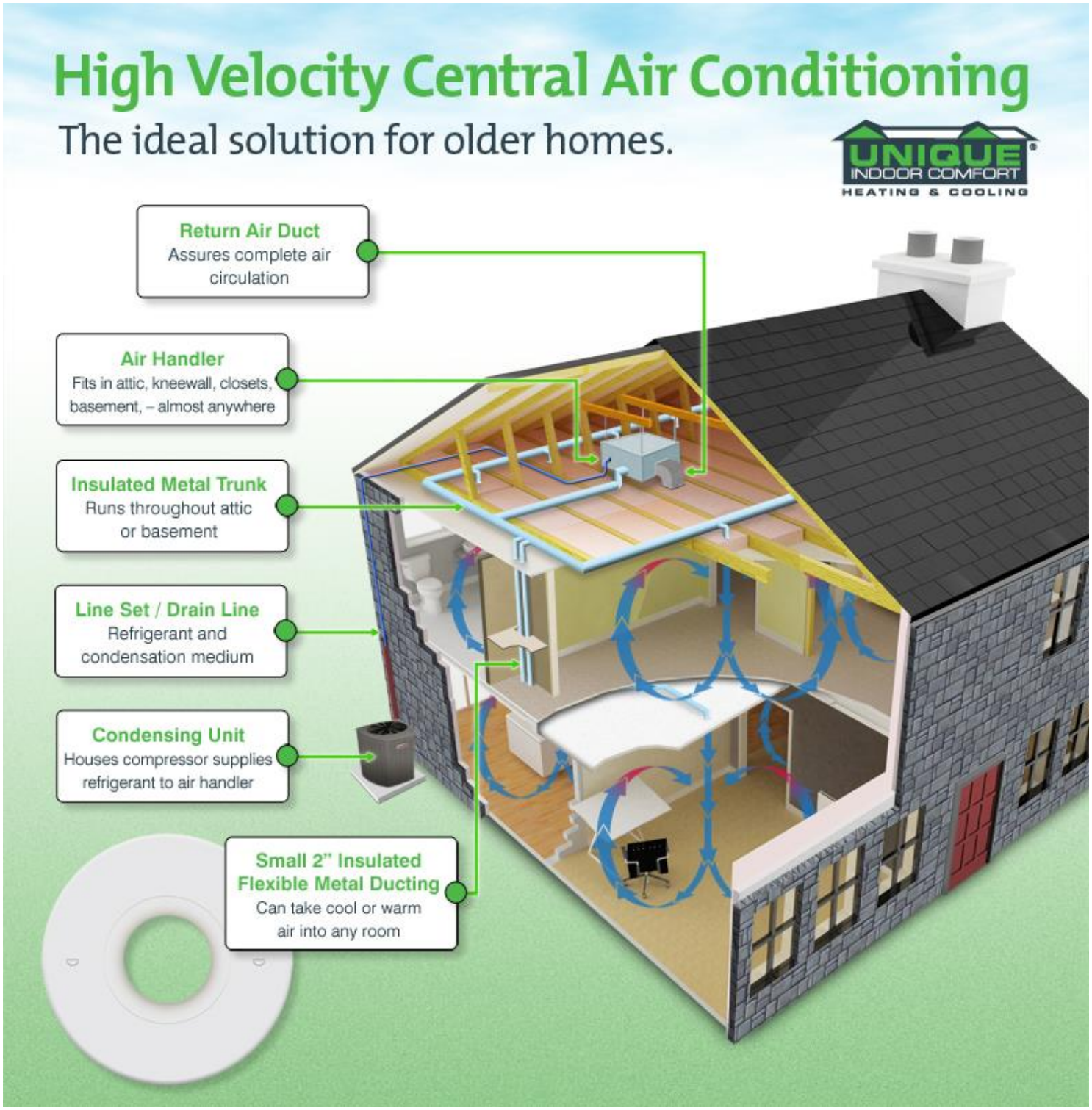
j. Geothermal – Is the most energy efficient heating and cooling system in the market today. It has been a proven alternative energy system in the US since the late 1940's. It is estimated that there are more than 50,000 geothermal systems now in operation throughout the country. These systems are considered alternative energy methods because generate their energy for a home or business through the earth where there is a constant temperature of (57%) in our area. Geothermal systems are currently more expensive than the above alternatives, but carry a 30% Federal Tax Credit until 2016 and in many markets local incentives are also available from States and Communities. As a result most geothermal systems can see a payback between 3 and 7 years. (SEER Ratings for Geothermal 30 – 60) According to industry standards has a life expectancy of its equipment of 25 to 30 years and its wells having a 50 to 100 year life expectancy. That is more than double all the other systems in the market today.
k. Free Hot Water (40%) – The excess heat that is generated with geothermal will provide free hot water for the home. The system is able to dump that excess heat into the home hot water system at no cost thus reducing the cost of hot water heating. Traditional gas hot water systems can be incorporated into the design to provide the additonal hot water for the family use.
l. Tax Credit - As a means of making geothermal affordable along with the 30% Federal Tax Credit that can be applied to the drilling and mechanical equipment installed in the

house. For example if the geothermal system cost $30,000.00 the tax incentive from the Federal Government would allow you to take $9,000.00 off your taxes next year or the year after that. This would bring the system cost down to $21,000.00 which could be within a few thousand dollars of a traditional gas and electric system The differenece is that the alternative energy system would also be 50% more energy or more.

m. Energy House Hybrid Systems – It has been the experience of the Energy House team that when the base heating and cooling is provided by geothermal and combined with mini splits for increased zones in a home as well as designed to meet the living habits of a homes residents that the highest efficiency systems are possible. The cost of these hybrid systems is greatly reduced when a whole house energy design using, passive solar, weatherization and insulation are the

5. Metal Ducting – Traditional with mastic to seal all joints and seams

6. Radiators – Incorporating traditional cast-iron radiators into a heating system can be done with gas boiler systems. Additional ducting is needed to provide the cooling as well to the home.
7. High Velocity Ducting –
    a. High Velocity Central Heating and Air Conditioning - An ideal solution for homes with radiator or baseboard heat, A Unique Indoor Comfort high velocity system fits any home no matter the age or construction. From restored barns, to simple colonials, to contemporary custom homes, high velocity provides comfort without the disruption of major renovations.
    b. Cool air is delivered through 2 inch flexible ducts designed and engineered to be installed into existing homes. There are no unsightly, exposed ducts. The compact air handler can be installed in attics, basements, crawlspaces, or even closets, allowing the design to meet almost any challenge.



8. Thermostats – 100% of non-programed thermostats will not provide energy savings.
    a. You can save money on your heating and cooling bills by simply resetting your thermostat when you are asleep or away from home. You can do this automatically without sacrificing comfort by installing an automatic setback or programmable thermostat.
    b. Using a programmable thermostat, you can adjust the times you turn on the heating or air-conditioning according to a pre-set schedule. Programmable thermostats can store and repeat multiple daily settings (six or more temperature settings a day) that you can manually override without affecting the rest of the daily or weekly program.
    c. Wifi controlled thermostats allow the property owner to watch their energy use from their laptop or smart phone when they are home or away from home. A number of these thermostats not only greater access but can also act as a home sensor that watches your furnaces operation and can alert you to when the furnace needs cleaning, filters and service.

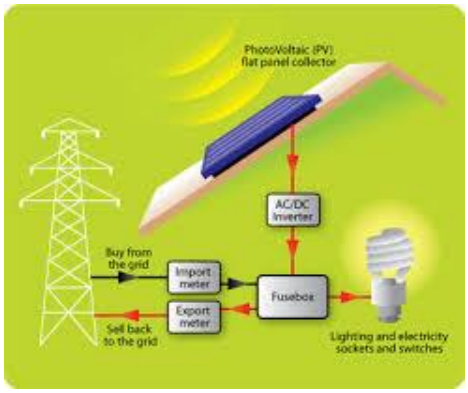
YOUR HOME – MECHANICAL

1. Existing Gas and Electric Heat Pump System – The existing system is only a few years old. It is high efficiency and should be retained in any energy upgrade that is considered. An analysis needs to be done on the system on it exact specifications.
2. Ducting – It was noticed that a duct blaster test was not done on the house at the time that the energy evaluation was done. It is necessary to determine what the air flow to each section of the house is actually in order to determine if enough CFMs are reaching each room of the house.
3. Dampers – If not enough air is being delivered to floors or room a system of dampers should be considered to redistribute the conditioned air as necessary.
4. New Zone Created – Depending on the existing air flow in the ducting system an additional zone of heating and cooling may be considered for the second floor. This could be done with two individual wall hung mini splits in each bedroom on the second floor.
5. Programmable Thermostats – Ecobee

6. Service Humidifier – Water running
7. Dryer Vent – Relocate to allow for better maintenance of this duct to keep the family safe.

Photovoltaic

1. Photovoltaic – Electrical Generation A photovoltaic system, also photovoltaic power system, solar PV system, PV system or casually solar array, is a power system designed to supply usable solar power by means of photovoltaics. It consists of an arrangement of several components, including solar panels to absorb and directly convert sunlight into electricity, a solar inverter to change the electrical current from DC to AC, as well as mounting, cabling and other electrical accessories to set-up a working system.
2. Tax Credit – There is a 30% tax credit from the Federal Government for the installation of a photovoltaic system. This tax credit is available until 2016. Other municipalities, counties, and states also have incentives to install this type of energy saving system on your property.
3. Payback – The life expectancy of a solar panel is projected to be 25 years according to industry standards. While the 30% tax credit is available from the Federal government in Virginia t is not usually recommended for homes due to the lack of local or State incentives which makes the return on investment now very high. But in DC their incentives can make it so the payback on photovoltaics can be around 5 years. That does not mean it does not make sense at all for a property owner to off-set their electricity rather it is up to the homeowner to determine the level of energy efficiency they wish to achieve.
4. Getting Started – Have a solar orientation analysis done to see if your property faces the sun sufficiently to be considered for this type of alternative energy system. Mature deciduous trees and other buildings blocking the sun will also have an impact on the effectiveness of a solar array.
5. Electrical Review - Have an electrical review done of your homes electrical needs by a BEA representative in order to find ways to reduce your electrical needs of your property.
6. Lighting – By switching from incandescent light bulbs to CFL's and LED's you can reduce your lighting demand by up to 80%.
7. Heating & Cooling - Through the use of geothermal and mini splits the amount of electrical load needed to power those systems could easily be supplied by a solar system that generates electrical power from the sun.
8. Battery Systems - Requires batteries to store power for the times when the sun is not shining. Does not use electric utility power. The stand-alone system is termed a "separate system" by the electric utility. However, a "separate system" in the utility's terminology can exist in a home that also has utility power as long as they are completely separated.
9. Grid System - Uses power from the central utility when needed and supplies surplus home-generated power back to the utility. Often termed a "parallel" system by the utility. The interface between the home produced power can be metered in a manner that when power is produced by the PVs and sent into the grid the meter will run backwards. When power is brought in from the grid the meter will run in the regular direction. This is called "net metering." Either approach (stand-alone or grid interface) can be done partially; with PVs being used in conjunction with a generator in a stand-alone system, or with the central grid power serving as a primary power source in a grid-interface system.



YOUR HOME – SOLAR PHOTOVOLTAIC

1. Have a separate evaluation done on the homes location with its shading and orientation at the same time that the solar hot water system is assessed.

SMART Technologies

1. Overview – Whole House Energy Management – Energy monitoring, thermostat control, system alerts, weather notification, and an informative web site posting of the homes energy usage that can be accessed through the homeowner's laptop and smart devices. https://www.bidgely.com
2. Areas of potential for the use of SMART Tech systems are as follows;
   a. Energy Monitoring – the process that the Energy House uses to monitor the energy usage of a property once the work is completed and the new systems are up and opperational.
   b. WattVision is one of the systems that we recommend but the actual system proposed for this home will depend on the needs of the client when all is said and done. Eguage may be another consideration

   c. Interactive HVAC thermostats – Ecobee – acts as a heating and cooling sensor that not only allows you to program the thermostat, keep track of weather but can be controled over the internet. The Ecobee will also inform the homeowner and the Energy House in a email, that there is a service issue with the system and if action is not taken to address the problem the thermostat will eventually shut down the unit to keep it from being damaged.

   d. Television and Audio – Television and stereo for the home
   e. Home Networking for Internet and Wifi


f. Home Sensors Networks - To monitor things like air quality, water leakage, gas leakage, moisture as well as a number of security items in the homes as well
g. Lighting Review – The Energy House provides a Lighting Review for free on homes that we are involved with on the energy side. One of our lighting designers will come out and do an inventory of your lighting and come back with recommendations on ways to save energy on your lighting needs. Our lighting designers are certified lighting experts and can find ways to save as much as 15% on your electrical and lighting usage.
h. Home Security – The Energy House team can provide a full complement of security systems through our partners. Doors and windows, fire and smoke alarms, carbon monoxide and air quality, safe rooms lighting, and security lighting, can be part of your SMART home system that can be organized on your tablet or smart phone.



i. Security Monitors and Cameras – Can be located in key locations and can be motion activated to provide another line of security for the family. Front entry door cameras can be installed with intercom and automatic door locking and opening functions. Perimeter cameras can be installed around the house as well as in the house to provide peace of mind.



j. Cell Phone Repeater Systems – To boost cell phone reception in hard to receive areas


k. Fresh Air – As part of an overall monitoring system with the use of sensors in the home the Energy House can monitor, maintain and control , fresh air, moisture, water leakage, gas leakage and much more.

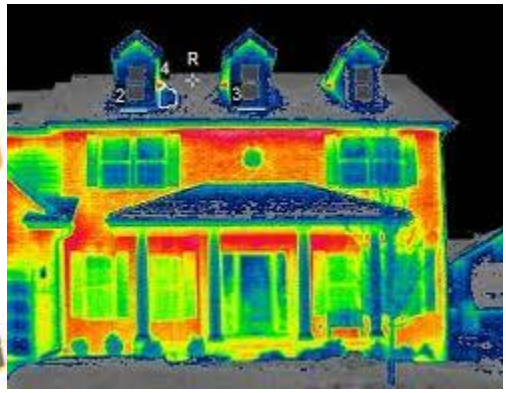
YOUR HOME – SMART Technologies

1. Home Audio Systems – While the house has been opened in most of the floors now would be the time to run speakers or just the wiring for speakers around the house.
2. Energy Monitoring – As part of our energy upgrade we would suggest that an energy monitoring system be considered for the home. The Energy House would include a package that could be owned by the property owner or would be willing to install a monitoring system as our cost for a period of one year.
3. Cable Television – Cost Reduction – BEA SMART Technologies can show you how to reduce your cable television costs by as much as 50%.
4. Lighting Review – Can be provided by one of our lighting designers to make sure the most cost effective lighting can be incorporated in your energy upgrade.
5. Sensors - We strongly recommend installation of sensor systems to detect water leakage, Carbon Monoxide, general air quality, and a number of other factors that can impact your life. These sensor systems could be automated to control various aspects of your home such as turning on bathroom fans when the humidity is too high.

How to Get Started!

1. Definition - A home energy audit, also known as a home energy evaluation, is the first step to assess how much energy your home consumes and to evaluate what measures you can take to make your home more energy efficient. An assessment will show you problems that may, when corrected, save you significant amounts of money over time
2. Energy Evaluation (Audit) - Is the next step in the process of lowering the Energy Usage of your property.
3. Certified Energy Evaluator – This non-aligned third part works for the property owner. The evaluation of the property can be provided by a firm that is recommended by your Energy House Account Manager.
4. Diagnostic Testing - Blower Door - used to determine air leakage in the home - Blower Door - How it Works - A blower door is a powerful fan that mounts into the frame of an exterior door. The fan pulls air out of the house, lowering the air pressure inside. The higher outside air measure the amount of air pulled out of the house by the fan

5. Thermal Imaging - Making the invisible visible is a useful first step in finding the air infiltration sources in the home.
6. Life and Safety – As part of a good energy evaluation all mechanical systems will be checked for leaks, they will be identified as to their age and efficiency, any mold issues will be identified, moisture leaks, faucets leaking,



Summary

Thank You – All the members of the Energy House would like to thank you for allowing us to visit your home and to provide this Energy Review. We are available to answer any questions you may have from this report as well as provide you with additional information on systems that we have made reference to and suggested for your consideration.

Energy Evaluation – From our Energy Review we have found a number of potential energy upgrades to your project. We now suggest that a full Energy Evaluation should be done on the property. A more in depth analysis should be done on the energy systems and materials proposed to determine actual energy savings from their inclusion in the project as well as their added cost. These projected costs will then be put into an ROI review of the upgraded energy design. Our recommendation of Kelly Ross-Gillespie of Kelly Green Raters who is an independent BPI certified http://www.bpi.org inspector should be scheduled to do a full Energy Evaluation on your home. This will be under $500.00 and will be paid directly to the firm which will allow the time necessary to certify all that has been reported in the Energy Review and more. Please see your Account Manager to schedule this study.

Energy Modeling – From the approved Work Detail the Energy House will hire BEA SMART Technologies to produce a Holistic Energy Model of your project. This is done as a means of determining the actual energy loads and then determining that overall saving that will result from the work being considered. The modeling will also tell us the size of the geothermal wells and mechanical units needed to meet that demand. The modeling will also help establish a workable budget for the project. The cost of this service is $400.00 and allows the homeowner up to 8 different alternatives of the Energy Design and systems to be run through the modeling software to find the optimum efficiency for their home. Passive solar and photovoltaics are part of this modeling that we do.

General Contracting – For the general repairs and improvements as well as the potential upgrade of the energy systems, the kitchen and the bathrooms, the foundation work and the new openings and hallways, the Energy House is able to provide you with full service. The Energy House team is made up of not only builders but designers, kitchen, bath, doors, windows and foundation experts that can handle all of the needs you will have in this project. No one builder, that we have seen has the abilities to not only build to your plan but also design the energy systems to be incorporated into the project that will reduce your operating costs each and every month and then monitor their operation and prove their assertions over the next year of you living in your house.

Work Detail – From the Energy Review and the Energy Evaluation the Energy House team will create a full Work Detail (Scope of Work) that will be considered for the pricing of all items on the plans you have provided. The Energy House project manager will be the only person that you and your family have to deal with in the process of billing, scheduling, and change-orders. We will have a full time job superintendent on your project from the beginning to the end of the process.

Energy House – Open House – Demonstration & Education Showcase – If this option might be a consideration for this project we can offer a 10% discount from our subs and from the Energy House itself for the opportunity to display your project before you move in. This would include coverage and reporting over the internet, through local media options all resulting in a series of open house events at the end of the job.