Home Efficiency Audit

Denise Ryan

Audit performed by:
Pascale Maslin
202 557-9200
efficiency@epower3.com

Introduction

Thank you for allowing us to perform this home energy audit. Energy prices are continuing to rise, and making your home run more efficiently saves you money, improves your comfort, and increases your home's value. If you have any questions or need additional information, please don't hesitate to call.

This report shows you:

- Results from the blower door test.
- Results from the audit.
- Opportunities for improving the energy efficiency of your home.
- A detailed explanation of recommendations.

Should you wish to check the air-tightness of your home after you have performed the recommended sealing, we can do a free blower door test if you invite 7 to 12 neighbors, friends, or family to participate in a short presentation and viewing of the test.

Blower Door Test Results

The results from the blower door test directly impact your heating and cooling bills. Hot air rises and increases the pressure at the top of the house, if it can leak into the attic or out of windows, and other fixtures, it will. This creates a negative pressure at the bottom of the house; so cool air gets sucked in from leaking windows and doors on the lower level of the house.

The leaks in your home are equivalent to having a 24" wide window open 18" all year round. For good air quality you need about 9" for ventilation. You are paying to heat and cool 9 additional volumes of air per day. These leaks are from the following:

Doors:

- The front door leaks, as the existing weather-stripping is old and warn out. Try Kilian hardware at www.kilianhardware.com to replace the existing product. I have included what I recommend in the appendix. This is much higher quality than you can buy in local hardware stores and will keep you sealed for 30+ years if installed correctly.

- Keeping door jams, weather-stripping and thresholds clean improves their performance and longevity. Just once a year, in the fall, take a vacuum cleaner and paintbrush to clear away collected debris.

Windows: All your windows leak a little. Like the doors, routine maintenance every fall improves a windows performance and longevity. Try the following:

- Open both sashes of the window.
- Remove the dirt from the bottom sill and jams with a paintbrush, toothbrush and vacuum clean.
- Clean the sill with warm soapy water.

- Seal any damaged sills.
- Close and latch the main window.

Your windows are old, and as mentioned, they do leak. Replacing windows is an expensive option, and it takes 20 years for them to pay for themselves. People think that if they have leaky windows replaced that their utility bills will be reduced; they are, but not by much. Leaky windows have a big impact on your comfort, but not on your utility bills. My recommendation is, that if maintenance in not sufficient, that you consider installing storm windows to help these seal these windows better.

Other leaks include:
The door in the Master bedroom accesses a space called the knee wall. This space has soffit vents that are ventilating the knee wall area, above and below the 2nd floor, and inside the walls and down into the basement. If you think that the structure of the house separates the 'inside' from the 'outside'. What is inside is conditioned air, and what is outside is unconditioned air. The barrier between the inside and the outside determines how effective your conditioning is inside the house. This knee wall space is connected to inside of the walls all over the house and there is not a clearly defined barrier between the inside and outside. The result is the outside air is removing heat from the house all the time. There are two options here:

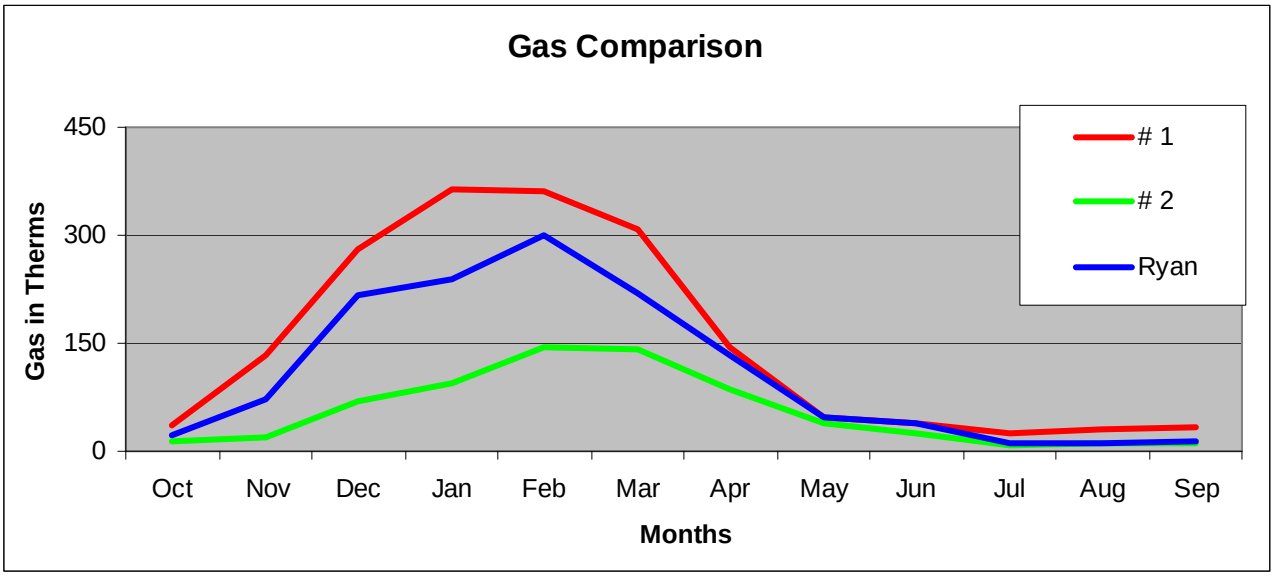
1. Include the knee wall space inside the house. This would mean that you close off the soffit vents and insulate the roof rafters and include the space in the house. You could insulate with foam (R-6 per inch and provides both a thermal and air barrier) or fiberglass batt (R-3 per inch and provides only a thermal barrier). Foam would be the most costly to perform and the most effective.
2. Exclude the knee wall space from the house. To do this you would add insulation to the walls of the bedroom, the ceiling of the bedroom, install baffles to block the air passage under the floor, and weather-strip the door going to that space. This option would cost less that the first, and be less effective. If you decide to do this option I would recommend you add R-30 to the walls and R-49 to the ceiling. You will also need to weather strip and seal the access door going into the knee wall space.

The fireplace damper and ash chute both leak. You can get a balloon online that seals the chimney at the following website:
http://www.amazon.com/Fireplace-Chimney-Plug-Balloon-Pillow/dp/B0001UZQIA
If you don't use the ash chute then seal it with a high heat caulk.

The hole in the wall where the exhaust to furnace and hot water heater goes outside, this also can be sealed with a high heat caulk.

We were not able to reach 50 Pascals of pressure due to the knee wall leak, so once that is fixed it would be a good idea to redo the blower door test.

Heating



The above graph is your gas bills in comparison to other similar sized homes I have audited in the area. Home #1 was the most inefficient home (low efficiency furnace, leaky house) that I have audited, and home #2 has a high efficiency furnace, R-49 insulation in the attic, and is a tightly sealed house. Most houses I audit fit between these two, as you can see you are about middle. I called the manufacturer of your furnace and they said it is a 68% AFUE, the minimum standard today is 80% and the maximum is 96.6%. Yours is ~ 25 years old. Don't wait for this one to die before looking into a new one as you will wind up getting it replaced at short notice and not get what you want. In the meantime the following strategies will help to keep your bills lows:

- Seal and insulate your home, I promise you will see a dramatic reduction in your heating bills.

- Regular maintenance to the HVAC system reduces the energy consumption as well as prolongs the life of your furnace.

- Check the program on the programmable thermostat they can reduce your heating costs by 30% and your cooling costs by 20%. The recommended settings are:
  - 68-71 ^{0}F Winter day setting when you are home.
  - 61-65 ^{0}F Winter nights and when you are out of the house for 3+ hours.
  - 75-78 ^{0}F Summer setting when you are at home.
  - 84-87 ^{0}F Summer setting when you are out of the house.
  - 80- 83 ^{0}F Summer nights.

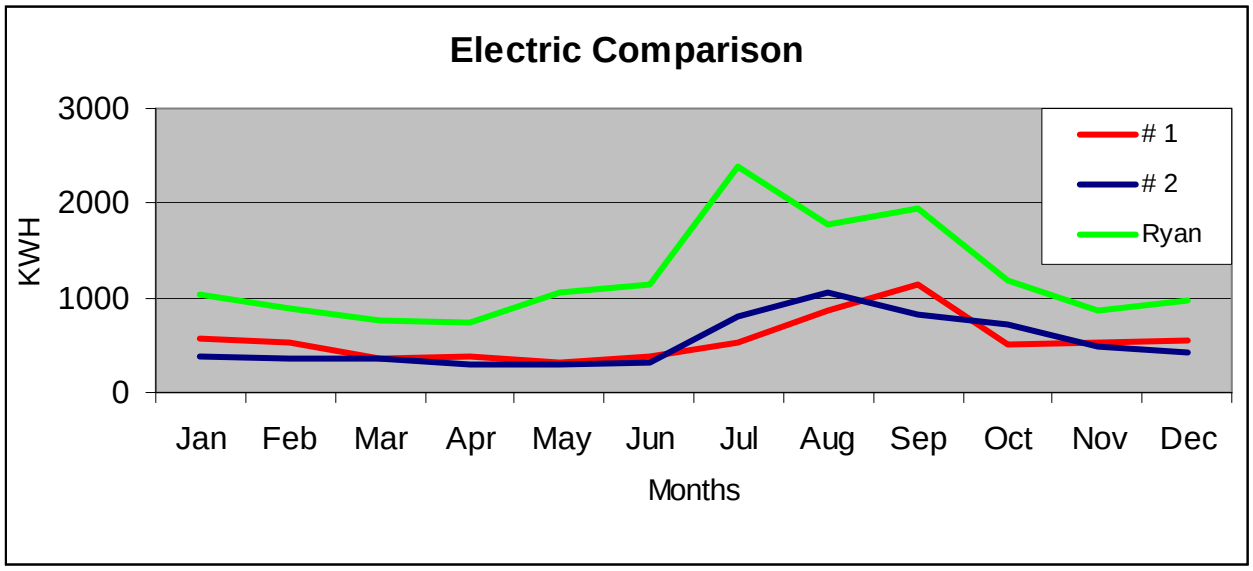
- When you do decide to replace this unit remember that the higher upfront cost of a high efficiency unit will pay for itself in reduced operation costs in 3 to 7 years at today energy prices, and less if you remember that energy is expected to increase in price. The following website has good information on efficiency:

http://www.aceee.org/consumerguide/heating.htm# . Make sure you get more than one estimate for the purchase and installation, and remember that you will start saving money on operating costs.

Water Heater

Heating water accounts for approximately 15 percent of a home's energy use. High Efficiency water heaters use 10 to 50 percent less energy than standard models, and 30 to 70% on models 10 years or older. Your unit is about 7 years old. As energy prices increase you may want to look into installing a solar hot water-heater; this would reduce your heating bills by 75 to 85%. Check out this website, note that the cost of installation does not include incentives. http://www.aceee.org/consumerguide/waterheating.htm Keeping 50 gallons of water hot all the time is not very efficient. Most people are unlikely to go out looking for a water heater until their existing one fails, leaving little time to look for a water heater that is efficient and meets their needs. There are a lot of technologies available and the most efficient water heaters are also the hardest to find and the most expensive to purchase, so it pays to think about your options early.

Electrics



The above graph is an estimate of your electrical distribution. Note that the average total KWH for an energy efficient house your size is about 6,500 kwh, and you are at 14,700. The most likely candidates for causing high electrical bills are the fish tank, the refrigerator and phantom loads. Strategies to reduce your electric bill include:

Purchase a Watt-o-meter:
This is a device that plugs into the wall and will monitor the electrical consumption on any appliance plugged into it. I have put a description and link in the appendix. I would start by monitoring each device and then you can decide what stays on and what can be turned off.

Reduce phantom loads:
Computers, stereos, chargers and other electronic devices account for about 10% of all residential electricity in the United States. Sixty percent of that is consumed while the devices are not in use. That amounts to 56,093,000 tons of carbon dioxide emitted per year! Making sure that computers, TVs, phone chargers are unplugged or turned off at the power strip can reduce your electric bill. Specific locations where you can reduce your phantom load are:

- Put your TVs and entertainment systems on power strips and turn them off. GAIAM makes a smart strip that has 3 types of outlets; 1 control outlet (TV), 5 controlled outlets, and 3 always on outlets. So that means if you turn off the TV, the outlet strip will turn everything else off in the controlled outlets, and anything that you don't want turned off such as the Tivo can be plugged into the 'always on' outlet. (See the Appendix for a description and link)

- Put you computer and peripherals on a power trip and turn the strip off after use. The Smart Strip works well for this application also.

- Put devices such as rechargeable vacuum cleaners on a timer so they are not being charged all the time. (Appendix)

- Install an outlet that can be turned on or off for you cell phone charger. (Appendix)

Switch to CFLs and LEDs:

Compact Fluorescent Lights use ~1/4th of the electricity of an equivalent incandescent bulb and also produce 1/4th of the amount of heat, thereby increasing the efficiency of your air-conditioning and decreasing your electricity bills. Each bulb has a reduction of about 70 lbs of CO_2 per year.

	10 CFLs	10 Incandescent R-30s
Kwh per year	204	1,095
Cost per year	$19.01	$101.84
Total energy cost over the life of the CFL	$130	$697.50
Total Cost over the life of the CFL	$144.70	$714.17
Savings	$569.47	

Standard spiral non-dimmable CFLs can be purchased at Home Depot, I recommend the N-vision brand.

Specialty CFLs and LEDs can be found at www.1000bulbs.com, I recommend Neptun for CFL reflectors (R-20s & PAR-20s) and dimmable bulbs, specify 2700K or less for warm white. Litronics are good for both dimmable and non-dimmable decorative bulbs.

Notes on CFLs:

CFLs need to be recycled; you can get a list of locations that will accept CFLs in your area at www.earth911.org. This list is growing and is being continually updated. 1000bulbs also sells containers that you can ship the bulbs to be recycled.

You can reduce your air-conditioning usage by:

- Installing window film to reduce solar gain on any windows getting full sun for more than four hours per day.

- Installing a whole house fan or installing window fans, one at the back and one at the front, that can create a cross breeze on those evening would increase the comfort of your home in the months where the outside temperature drops substantially and could cool the house in the evenings. The following fan is for house up to 2,500 sqft. This is a strategy that makes a huge difference in both comfort and cost. In the next couple of years you will see rebates and incentive for energy efficiency implemented at both federal and state levels, you should wait till then to do this.

http://www.airscapefans.com/products/whf17

Insulation and Attic Penetrations

As previously mentioned, your attic insulation is about an R-6. The EPA recommendation for this area is R-49. Of all the recommendations in this report this one will have the biggest impact on your comfort and your utility bills. I have included a number of insulation companies that I have worked with in the past. Note that I do not get any kick backs from any companies I recommend.

There is no insulation in the brick walls. Due to the method of your homes construction there is only about ¾" between the brick and the plaster wall, and this is not enough to add insulation to.

Kitchen

Refrigerator: The average American refrigerator consumes 800 kwh of electricity per year. I was unable to determine the age of your Haier refrigerator; it was purchased at Walmart or Target, and was made in China. I recommend you determine its energy consumption, as it may be a contributor to your high electric bills. The circulation around the unit is good. I cleaned the gasket; this should be done twice a year. The temperature is between 35 – 40 ^{o}F, which is within normal operating range.

The more you keep in the fridge, the less air that needs to be cooled after each time you open the door, but this needs to be balanced with having enough airspace to maintain adequate circulation, so ~80% full is the maximum. By keeping the gasket of the door clean and maintaining adequate ventilation around the unit you can reduce electrical consumption by 10 – 20%.

Dishwasher: Dishwashers uses about 1,000 kwh of electricity per year, most of that is heating the water to 140 ^{0}F, so only running the unit when it's full and running it on Normal Wash and not using the Heat Dry option saves electricity and money.

Water: The kitchen faucet is not leaking and it has an aerator; this device reduces the water use while increasing the water pressure.

Bathroom

None of other bathroom facilities are leaking. The sinks all have aerators. All toilets have a small size flush.

Financing Options

There are currently loan options available that will make money available for energy efficient improvements based on the monthly cost of the loan being less than the money saved, thus the improvements do not cost you anything and in fact save you money. In the appendix is the contact information of one broker that focuses his business on these types of loans.

List of Recommendations

Low or Zero Cost Items:

Doors and Windows

- Repair all leaking doors
- Perform routine maintenance on windows and doors at the beginning of each winter

Insulation and Penetrations

- Seal the house
- Address the knee wall issue ***

Heating

- Check the program on the programmable thermostat
- Perform routine maintenance on your HVAC every two years
- Research a replacement for your HVAC and water heater equipment

Electrics

- Purchase a kill-o-watt meter and monitor specific device consumption
- Switch your light bulbs to CFLs or LEDs
- Reduce phantom loads
- Reduce AC usage

Kitchen

- Clean refrigerator gasket annually
- Clean refrigerator coils annually

High Cost Items

- Replace the HVAC equipment

Items for future consideration

- Install a whole house fan
- Install solar hot water heater
- Install storm windows

*** These items have the most impact on your comfort and utility bills

Contractors:

AC&R spray foam insulation at 301 937-4710

NOVA Spray Foam Insulation at 703 404-224

Quality Insulation for fiberglass batts or loose fill: 301 257-4116

Discount Energy Services for fiberglass batts or loose fill: 301 565-9350

Bill Danos at Now Go Solar for solar water heater: 410 440-4856

Leonard Davis for HVAC: 240 793-2053

Energy Efficient Loans: Jay Odell; 240-743-7239

Appendix

Devices, which reduce phantom loads:

Smart Power Strip

Even when they're off, today's electronics continue to draw electricity we pay for but don't use. This revolutionary power strip prevents that waste. Plug your main device (computer, TV, etc.) into the primary outlet and its peripherals (printer/scanner or VCR/cable box, etc.) into the others. High-tech sensors know when you shut down the main device, and they cut off everything else. Saves up to 72% of the energy your systems use, eliminates 640 lbs. of CO_2 per year and offers state-of-the-art surge protection. With 6' cord, six no-idle outlets and three always-on outlets. 16"L x 6¼"W x 2"H. China.

http://www.gaiam.com/product/eco-home-outdoor/energy-efficient-climate-control/energy-saving-tools/smart+power+strip.do

Digital Plug-In Timer DT121C:

The following timer can be used to control device when you don't need it to be on all day (for example a rechargeable phone only needs to charge for about an hour a day). It's available at Strosneiders:

Features
- 2 ON / 2 OFF settings per day
- Easy to set
- Large display is easy to read
- Manual override
- To-the-minute accuracy

Specs
- 8.3 Amps, Resistive and Inductive
- 300 Watts Tungsten
- 1/3 H.P.
- 125 VAC, 60 Hz
- Uses 2 L1154, SR44 or LR44 batteries (batteries supplied with timer)

Leviton 15 Amp Decora Combination Devices

5625-E - **15 Amp Single-Pole / 5-15R Decora Combo Device - Black**
15 Amp, 120 Volt, Decora Style Single-Pole / 5-15R AC Combination Switch, Commercial Grade, Grounding, Side Wired - Black , UPC: 07847704051
Price: ~~$30.91~~ (You Save $10.04)
Our Price: $20.87

http://www.onestopbuy.com/Decora-Combo-15-Amp-35740.asp

You can get the above combo device for about $12 from a hardware store.