



**BLOCK
ENERGY
DESIGN**

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Home Energy Efficiency Report



Property Address: **132 Van Ness Street**

City, State, ZIP: **Santa Cruz, CA**

Date of Site Visit to Property: **July 9, 2009**

Site Visit and Report by: **Sharon Block**, CHEERS® Certified Existing Home Analyst,
HERS Whole House Energy Rater, Certified GreenPoint® Rater, LEED AP and
Rick Meyer, CHEERS® Certified Existing Home Analyst

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Introduction and Methodology

Thanks for the opportunity to inspect, measure and analyze your home for possible energy efficiency upgrades.

This report is based on questionnaire information, detailed measurements and an inspection of the property identified on the cover page by our analysts during a site visit. We inspected the cottage as well as the main house and understand that both buildings run off the same meters. The methods we use to conduct the energy survey are recommended by California Home Energy Efficiency Rating Services ([CHEERS®](#)), a public benefit, non-profit organization established in cooperation with the state and utility companies. CHEERS also are responsible for monitoring our work. Some of our methods are recommended by the California Building Performance Contractor's Association, though we are not contractors. Our work was performed under a signed contract that contains important warranties and limitations on liability that you may wish to refer to in connection with your review of this report.

Information that extends and explains elements of this report are available by following links to web pages. To learn more about the typical tests we perform and how to interpret test results that appear in this report, [Ctrl-click here \(http://members.cruzio.com/~rmeyer/Tests.htm\)](#) if you are reading this report on your computer. If you're reading a paper version, you have to type the web address into a web browser on a computer. If you do not have web access, you can call us to request a printed copy of these "appendices."

Your Energy Usage

We analyzed the PG&E usage data you provided and our analysis appears at the end of this report. We estimated how much of your gas bill was spent on space heating, by determining the gas usage in the summer months when the furnace is usually off, and set this as a baseline usage associated with year-round water heating, cooking, clothes drying and similar loads. By deducting the baseline load from all gas usage we arrived at the estimated heating gas usage. We then calculated your *home heating index*, a measure of how efficient your home is, given its size and local climate conditions. Your home heating index is in the range 4.3 – 5.5 (depending on the source of microclimate data we use in the calculation), indicating that your home does not use a lot of gas for space heating. You attribute some of the low usage to your setback thermostat and low thermostat settings. Since you spend only about \$551.09 annually on heating, your savings from making our recommendations will be modest and the period needed to recapture your investments would be relatively long. However, you will be helping to reduce global warming, and some of our recommendations may improve your health, safety and comfort and the durability of your home. We are available to quantify the savings from potential upgrades through software energy modeling.

Recommended Improvements in Detail

Safety Inspection or Replacement of Wall Furnace in Cottage

We smelled combustion gas in the cottage after running the wall furnace. We found 6 ppm carbon monoxide (CO) in the flue itself, indicating nearly complete combustion. However we also measured 3 ppm in the hot air rising into the room from the furnace, and 2 ppm in the bedroom where the furnace is located, indicating the escape of flue gas into the rooms. The furnace is an old Williams wall furnace. A full safety inspection might reveal holes corroded into its heat exchanger or flue connector that is releasing the toxic gas into the house. Although the measured levels of CO do not yet exceed the EPA warning level of 9 ppm, this is a potential

health and safety issue that could worsen. We recommend you address it soon. We believe PG&E still conducts free safety inspections. Until a full safety inspection can be conducted or the furnace replaced, you may want to remove the thermostat and turn off the gas to the furnace, which may not be needed in the summer. The current furnace has efficiency in the range 65-70%. A replacement wall furnace will have a minimum efficiency of about 80%, a significant improvement. A small condensing furnace, could have an efficiency of 90 – 95%, but is significantly more expensive and may not be cost justified. We are not aware of any condensing furnaces available as wall furnaces that would fit in the space between the studs like the current wall furnace. If the cottage were better insulated, a smaller furnace would suffice, so we suggest deciding whether or not to add insulation before replacing the furnace.

Replace or Service Water Heater in Cottage

We noted substantial standing water under the water heater (see photo below) indicating a possible leak. While the water heater was running, there was a knocking sound, indicating the buildup of sediment and/or scale in the bottom of the tank. Leaking is usually a symptom of a failing water heater and knocking the sign of build up. When sediment from incoming water or scale from dissolved minerals builds up in the bottom of the tank, it acts as insulation causing the flame to be on for longer periods and the metal tank to get much hotter, reducing efficiency and causing early failure of the tank bottom.

If the water heater is only a few years old and this is a premature failure, it is likely caused by rapid build-up. To avoid premature failure of a new water heater, clean out sediment or scale periodically. You can examine the anode and access the bottom of the old water heater to determine the nature of the failure and predict what type of servicing will be needed for new one and whether sediment or scale is the main problem. You should also replace the sacrificial anode when necessary. The standing water in the water heater closet will rot or is already rotting wood, and the leak will worsen with time.

We noted 10 ppm CO in the water heater flue gas indicating good, complete combustion, but also 2 ppm in the water heater closet. This is not a dangerous level, but it is possible that flue gas is escaping from gaps in the flue pipe or that the pipe is obstructed. We recommend that these issues be checked carefully when the water heater is serviced or replaced.

Consider Upgrading Attic Insulation to R-30

We have determined through our inspection that the insulation in your attic is only about 3 inches deep and is a mixture of fiberglass and cellulose (see photo). It is likely to have an R value of only 11-13. You may consider adding blown cellulose insulation to increase the total R value to 30, about 10 inches deep, the current recommended level. We recommend sealing the envelope (see below) before insulating, so that the added insulation does not cover up areas that need sealing. We noted some old knob and tube wiring in the crawl space – if any of it is still active in areas to be insulated, consult with an electrician. The National Electric Code forbids the installation of loose, rolled, or foam-in-place insulation around knob and tube wiring.

Typically an insulation contractor will recommend that blown loose cellulose or fiberglass be added. The insulation contractor must make sure that the attic will still be well ventilated after the insulation job. This may involve adding baffles near roof vents in the eaves/soffits prior to “blowing” the insulation to prevent vents from being blocked by the added insulation. The insulation contractor should insulate the hatch or fold down stairs to the attic with foam board and seal it with weather-stripping or a gasket. If you want to reinstall the floor after insulation is added, it would be necessary to remove the plywood flooring and add deeper ceiling

joists before blowing in insulation, so that the deep insulation does not cover up the tops of the joists and they can support the floor again. Blowing in new attic insulation is usually a cost effective measure. There was plastic laid over the insulation which may capture moisture in the insulation, thereby degrading the R-value. We would recommend removing the plastic.

We were not able to determine that level of attic insulation in the cottage due to clothing blocking the access hatch. If you obtain bids for added insulation in the main house, consider having the contractor examine the insulation level in the cottage as well and possibly bid on it. If the cottage attic is not used for storage, adding insulation will be easier than in the attic of the main house.

Consider Wall Insulation

By probing next to electrical outlets in the cottage, we found that there is probably no insulation in the walls. We were unable to find a similar non-destructive way of probing for insulation in the main house, but given the age of the house, and seeing some intact lath and plaster walls, and no signs of patched holes where insulation may have been blown in, we suspect that there is no insulation in the main house walls either. You may want to ask an insulation contractor experienced in blown cellulose or fiberglass in older homes to evaluate the potential for insulating the walls (and attic) of both buildings. Typically 2 – 3” diameter holes are bored in the exterior siding, and cellulose or fiberglass is pumped into the wall cavities. Because we could not confirm the lack of insulation conclusively, you or the contractor may want to drill test holes of the type that would be used to pump in insulation. The presence of fireblocks in the cavities can complicate the work. On the other hand your house may have balloon framing so that the contractors could possibly blow insulation from the attic without cutting and repairing holes. There is no top plate with balloon framing. Again, watch out for active knob and tube wiring. If you want to learn more about insulating your home, we recommend: [www.ornl.gov/sci/roofs+walls/facts/Insulation Fact Sheet 2008.pdf](http://www.ornl.gov/sci/roofs+walls/facts/Insulation%20Fact%20Sheet%202008.pdf) starting on page 20.

Duct Leakage Acceptable

We measured forced air heating duct leakage of 140 CFM₂₅, an acceptable value. This represents 12% leakage of the estimated 1155 CFM airflow in your heating system (71,000 BTU/1000 x .75% efficiency x 21.7 = 1155). Your ducts currently need no repairs. New homes in California are often required to have a total leakage of 6% of the total airflow, but for existing homes, a more realistic target is about 15%, and your leakage is below this. Studies have found that the average California home's ducts leak 30%, an appalling waste of energy and money. To learn more about how we conducted this and other tests and the meaning of test results, [click here \(http://members.cruzio.com/~rmeyer/Tests.htm\)](http://members.cruzio.com/~rmeyer/Tests.htm).

Reduce Building Leakage

Our tests revealed that your home's envelope is "leaky". Your home's envelope consists of the exterior walls, floors and ceiling that hold air inside. Total envelope leakage was 4450 cubic feet per minute measured at a pressure of 50 pascals (4450 CFM₅₀), which is much more than the leakage needed for healthy ventilation. Under typical conditions in our climate zone, this would amount to 212 CFM_{nat} of natural ventilation (4450 CFM₅₀/ 21 N_{LBL} = 212 CFM_{nat}). The required healthy airflow is only approximately 79 CFM_{nat} (1700 square feet CFA * 8 foot ceilings = 13,600 cubic feet * .35 air changes per hour = 4760 cubic feet per hour = 79 CFM_{nat}). In other words air you are paying to heat is escaping at nearly three times (212 / 79 = 2.7) the rate that is needed to provide healthy ventilation. If we added together all the leaks in your house, most of which are hidden, they would equal to having a window open all the time, with an open area equivalent to 2.6 sheets of copy

paper (ELA = 4450 * .055 = 245 square inches). To learn more about how we conducted this test and the meaning of test results, [click here \(http://members.cruzio.com/~rmeyer/Tests.htm\)](http://members.cruzio.com/~rmeyer/Tests.htm).

Some people assume that they should not seal their houses because fresh air is healthy. It is true that many houses have indoor air pollution and that fresh air dilutes indoor air pollution, and is therefore healthy. However, above the minimum requirement, more is not necessarily better, as in many health matters. The best approach is to eliminate any pollutants and then improve sealing. We did not detect a measureable level of carbon monoxide in the closet containing the water heater and furnace where any concentration would be highest, so this should not be a concern. Since your house is older, you should have no concern with formaldehyde gas from building materials. Of hundreds of tests for radon in Santa Cruz, roughly 5% have detected levels above the EPA recommendation – if this possibility concerns you see www.epa.gov/radon/pubs/citguide.html and www.cdph.ca.gov/HealthInfo/environhealth/Pages/Radon.aspx.

You may want to solve the moisture issue (see below) before envelope sealing, so that sealing does not increase the humidity by trapping moisture from the crawl space inside the envelope. To reduce leakage, install weather-stripping on doors to unconditioned space, including the front and back doors where we noted no weather-stripping. Several hundred CFM of the measured leakage was coming from the door to the water heater/furnace closet. You may apply weatherstripping and a sweep for the bottom of the door and seal the two vents if it is safe and legal to do so according to a consultation with a licensed HVAC contractor. In particular, there must be a sufficient area of opening to admit “make-up” (combustion) air after sealing the door. You mentioned that you have already provided a vent of sufficient size to the crawl space and have consulted with an appropriate specialist.

We recommend sealing the furnace closet first, since that will isolate it from potential backdrafting of flue gas caused by any negative pressure in the house. After sealing the door, you will have to be careful not to block the vent in the closet floor – inadequate combustion air could create dangerous conditions. A barrier, such as a raised sheet metal or plywood “dam” around the vent could prevent items from being placed on top.

You may want to focus next on any leaks in the floor, since we have found excessive moisture in the crawl space that may be entering the house and the crawl space is often a source of pollutants such as pesticide residues from termite treatments, fiberglass fibers, mold, radon or other unhealthy substances.

We noted leakage around the fireplace damper. Rather than replace the current damper, for which an exact replacement is probably unavailable, consider adding a new damper in a different location. You may find ideas for tight-sealing dampers at www.chimneysupply.com. Bear in mind that there are codes that require the fireplace flues extend a certain height above the roof.

You may work on sealing leaks yourself, or hire a home performance contractor to do so. Urethane foam in a spray can and caulking and many other materials can be used to seal leaks depending on their size and location. We suggest the work be done using a blower door to track the effectiveness of sealing work during or after the work, and we are available for this kind of testing.

We also noted some leakage in your windows. Many people assume that the worst leaks that need sealing are around doors and windows, but energy inspectors have found they are more typically found in walls, floors, unconditioned attics, electrical outlets, recessed lighting fixtures, holes where pipes or wires pass through walls, basements and many hidden areas. Home performance contractors, like those listed in the Resource Directory at the end of this report, often have specialists in sealing work, but you can often find some of these

leaks and seal them with caulking, urethane foam and other methods yourself. You could fix as many leaks as you can find, and then call professionals in to finish the job.

Your goal should be to reduce leakage down to the minimum ventilation guidelines of .35 air changes per hour (ACH) which will bring a whole house full of fresh air in about once every three hours. Your goal of 79 CFM may or may not be affordable given the location and number of leaks.

Fresh air from leaks is unreliable since there is almost no flow on a still day when the temperature outdoors is around 70 degrees. On a cold, windy day, there is far too much ventilation, just when that extra flow wastes heating energy. In all, the flow rate is usually either much higher or much lower than optimal. Although most houses do rely on it, it is better seal a house tightly and use a small, efficient, continuous ventilation fan or your central heating/air conditioning unit to distribute fresh air to every room. Leakage air may also go to the wrong places in the house and may be drawn from sources of polluted air in the crawl space. The next version of the California Energy Code will require the use of this method in new houses.

We recommend conducting a backdraft test after sealing work is complete, to make sure that under the new conditions, there is still no potential for pulling flue gas into the home. We are available to conduct the test.

Clean/Replace Furnace Filters

We removed the metal mesh and electrostatic filters from the furnace to conduct the blower door test. We noted that both were dirty. This condition reduces their effectiveness at filtering dust and also impedes airflow, reducing the efficiency of the furnace. We recommend obtaining a supply of filters and replacing them every few months as soon as they becomes dirty, and at least annually. We also recommend cleaning the electrostatic filter per the manufacturer's recommendations at the same time.

Moisture Problem

We noted corrosion on the furnace motor (see photo) and on the cold water intake to the water heater, indicating persistent indoor moisture. You reported mildew in the TV room. We measured a relative humidity indoors of 58% indoors and 48% outdoors. Because the temperatures were almost the same indoors and outdoors, no adjustment is needed and so these figures represent significantly more moisture in the indoor air than the outdoor air. You told us that there were no recent activities indoors that could have temporarily elevated the humidity.

We inspected the crawl space and found substantial moisture in the soil, although the weather has been dry for many weeks. Our conclusion is that it is probable that moisture from the crawl space is entering the house through leaks in the floor. 60% and higher humidity levels are considered by many authorities unhealthy because they encourage the growth of mold and mildew on interior surfaces and respiratory infections in humans, and can contribute to the deterioration of building materials through termites and wet rot. While our measured level is a little below 60%, the humidity in your home likely exceeds 60% during less dry seasons. If you are not experiencing any of these problems, you might choose to ignore the issue of indoor humidity.

If these problems do occur, you may want to consider the installation of a ground vapor retardant barrier on the ground in the crawl space. This should be thick reinforced polyethylene sheeting, such as Moistop Ultra 15, with the seams sealed with mastic and the edges sealed to the foundation walls and any pier blocks with mastic. A rugged material is less subject to puncture or tearing when people are working the crawlspace and is

less likely to become torn. A minimum thickness of 6 mil vapor barrier is recommended. See <http://www.crawlspaces.org/> for more information.

Prior to installing the barrier, we recommend removing any cellulose debris on the ground that can attract termites and any sharp objects that could puncture the barrier. Some building officials require that a band of several inches of concrete remain exposed on the foundation wall between the mud sill and the top of the plastic, and piers to facilitate inspection for subterranean termite tubes and that is also our recommendation. We recommend monitoring the humidity in the home if a vapor retardant barrier has been applied, to determine its effectiveness. Inexpensive consumer devices can measure relative humidity accurately enough.

Working in the crawl space would be difficult. On one side of the house, clearance from the ground to the bottom of the floor joists is about 18-20", but on the other side clearance is less than 18" and a girder is even lower. We noted fiberglass insulation in the floor of about R 11 in fair condition and the ducts that were visible were in good condition. Some insulation has fallen and should be reinstalled when other work is done in the crawl space.

Other measures that would help to reduce indoor humidity would be to replace the old kitchen exhaust fan with a more effective fan and to use it during activities that release moisture or odors such as boiling food or using the dishwasher, and to use the bathroom exhaust fan especially after showering. Sealing leaks in the floor (see recommendation above) would also help. Avoid over-watering gardens that adjoin the house and make sure the ground near the house slopes downward away from the foundation wall for several feet.

Seal Access to Crawl Space

In our inspection of a small outdoor access door in the main house that reveals the plumbing to the bathtub, we noted mouse droppings. We recommend sealing all holes and cracks that could allow pests into the crawl space with urethane foam or caulking, while preserving the existing screened vents.

Cottage Roof Maintenance

The attic and the crawl space in the cottage were both inaccessible and we could not determine the level of insulation, if any in the ceiling and floor. While looking for insulation in the attic of the cottage from the outside on a ladder, we noted missing gravel on the tar and gravel roof. The exposed tar will deteriorate much more rapidly than when it is covered by gravel. It may be possible to extend the life of the roof somewhat by adding gravel or redistributing the gravel that is there with a roofer's gravel rake. We also noted several areas of deteriorated wood in the eaves of the cottage. This issue is outside our area of expertise and we recommend that you consult a specialist.

Weatherstripping Cottage Doors

We noted that both doors to the cottage are lacking weatherstripping and recommend that it be installed.

Appliances

When your appliances need replacing, we recommend that you purchase Energy Star appliances. Please see http://www.energystar.gov/index.cfm?c=appliances.pr_appliances for Energy Star refrigerators, clothes washers and dishwashers.

Note

Our inspection of gas-fired units was limited and we did not perform a full safety check. We recommend regular check ups. PG&E can conduct free safety inspections – see our Resource Directory – or you can contact a heating, ventilation and air conditioning contractor. Gas fired furnaces need annual maintenance; many heating contractors offer a low cost annual furnace “tune-up” that can save energy and prolong the lifetime of the equipment.

We appreciate receiving any comments on this report. You will either help us to improve our services or encourage us to keep up the good work. Please email to Sharon@BlockEnergyGreen.com. We may publish some of the comments we receive, with your name and city on our website and in other places.

Inspection Photos and Findings



Water under and behind water heater in cottage. Probable leaking water heater.



Measuring carbon monoxide content of cottage water heater flue gas.
The reading was low, which is good.



White powder below motor appears to be some type of corrosion indicating possible excessive moisture.



Close up of the same corrosion.



Blower door test in process. We noted a high level of envelope leakage.



Damper in fireplace has large “holes” and was a significant source of air leakage.



Back door doesn't seal well. Large gap at upper left corner



Looking for insulation in cottage attic from outside since attic hatch inside was inaccessible. Result inconclusive.



Measuring outdoor relative humidity. It was significantly lower than indoor humidity.



Insulation in the attic is only about 3" thick.



We recommend removing the plastic that covers the attic insulation to prevent the trapping of moisture.



Return Duct in Attic





Electrostatic cleaner in furnace. The filter was dirty.



Dirty electrostatic filter close-up.



Wall behind tub from exterior. Some rodent droppings found.



Ground under house was somewhat damp. This could be the source of moisture and cause higher than average humidity in the house.



Note: Some areas the floor insulation has fell out. These could be repaired at the same time that a ground moisture retardant barrier is installed.



More fallen insulation.



This example (not a photo of your house) has a ground vapor retardant barrier made from 15 mil thick MoistStop Ultra. All joints are taped. The edges of the polyethylene are sealed to the foundation wall and taped around pier blocks.

Resource Directory

The following resources will help you learn more about energy efficiency, better interpret our report and find products and contractors to help you implement our recommendations. We primarily focus on businesses in Santa Cruz, Monterey and San Benito counties. Some contractors in Silicon Valley are willing work in Santa Cruz and further south.

To maintain our independence and impartiality and your trust, we receive no compensation from any contractor, manufacturer or retailer. Appearance on our list does not imply an endorsement or referral, and we do not warrant any services or products other than our own as set forth in our contract.

We are available to do an independent retest, after contractors have finished their work.

Implement Our Recommendations

You can find local contractors that have been rated as excellent by their customers by subscribing to Angie's List at www.angieslist.com.

A free source of contractors screened by their clients and investigated by a rating agency can be found at www.DiamondCertified.org. They will also send a free booklet of certified local businesses if you call (800) 738-1138.

Home Performance Contractors

The following contractors advertise themselves as home performance contractors. In this context "performance" is used to mean energy efficiency and optimum health, safety and comfort of the indoor environment. They may be qualified to perform some of the energy upgrades we have recommended. Make sure the specialties of these contractors match the improvements you plan, and be sure to check references.

Ron Jones
Sustainable Home Solutions
www.SustainableHomeSolutions.com
ron@SustainableHomeSolutions.com
706 Freeman Court
Santa Cruz, CA 95062
831-462-6236 office
831-332-3453 cell

Van Meter Home Performance Systems
www.vanmeterhps.com
9045 Soquel Drive #3
Aptos, CA 95003
831-689-9135

General Contractors

Dale Tracy, Certified Green Building Professional
PO Box 2495
Aptos, CA 95001
831-477-7862
daletracy@cruzio.com

Insulation Contractors

Tri-County Insulation
910 George St.
Santa Clara, Ca 95054
408-567-9955
<http://www.tricountyinsulation.com/>

West Coast Insulation, Inc.
121 Beech Street, Redwood City CA 94063
(650) 369-7111
(650) 369-7110 (Fax)
www.westcoastinsulation.com
info@westcoastinsulation.com

Although this insulation contractor is in Silicon Valley, they will do jobs in the Monterey Bay Area. They offer many types of recycled as well as virgin insulation.

Window Contractors

Lighthouse Windows
(831) 426-2601
317 Potrero Street
Santa Cruz, CA 95060
www.lighthouse-windows.com/index.html
guy@lighthouse-windows.com

SGK Home Solutions, Inc.
(877) 264-6964
(408) 264-6126 (Fax)
3801 Charter Park Court, Suite B
San Jose, CA 95136
www.sgkhomesolutions.com
vladsgk@gmail.com

Heating, Ventilation and Air Conditioning (HVAC) Contractors

Airtec Service
(831) 728-2000
175 Aviation Way
Watsonville, CA 95076

D Right Temp Heating and Air Conditioning
(831) 475-1785
10295 Highway 9
Ben Lomond, CA 95005

Bogner's All Air, Inc.
(831) 438-5254
(800) 438-5254
5310 C Scotts Valley Drive
Scotts Valley, CA 95066
www.bognersallair.com
steve@bognersallair.com

Bruce Mechanical
360 D Coral St.
Santa Cruz, CA 95060
831-457-1181

Lighting Supply

Riverside Lighting & Electric
300 Soquel Avenue
Santa Cruz, CA 95062
(831) 423-7411
info@riversidelightingandelectric.com
www.riversidelightingandelectric.com

Solar

Joel Kauffman, Director of Business Development
Independent Energy Systems, a Real Goods Solar Company
1115 Thompson Ave. #1

Santa Cruz, CA
831-477-0943
www.iesolar.com
NABCEP Certified Solar PV Installer™

Solar Technologies
619 Soquel Ave.
Santa Cruz, CA
421-0440
www.SolarTechnologies.com

Infrared Photographic Imaging

Thermal imaging can “see through walls” to locate missing, poorly installed or wet insulation, and identify hard-to-find envelope air leaks and roof water leaks.

Visual Cue Thermal Imaging
Lorna G. Fear, Certified IR Thermographer
650-701-1032 Office
650-520-4869 Cell
www.infraredmagic.com
lorna@infraredmagic.com

Tax Credits and Rebates to Help Pay for Improvements

PG&E Rebates:
www.pge.com/myhome/saveenergymoney/rebates

Database of State Incentives for Renewables & Efficiency www.dsireusa.org include Obama stimulus tax credit

Do It Yourself Energy Efficiency

The Homeowner's Handbook to Energy Efficiency: A Guide to Big and Small Improvements by John Krigger and Chris Dorsi (Saturn Resource Management, 2008)

Consumer Guide to Home Energy Savings, 9th ed. by J. T. Amann, A. Wilson and K. Ackerly of the American Council for an Energy-Efficient Economy (New Society Publishers, 2007)

The Carbon Buster's Home Energy Handbook by G. Stoyke (New Society Publishers, 2007)

Residential Energy, 5th ed. by J. Krigger and C. Dorsi (Saturn Resource Management, 2009). This book was written for professional readers, but is mostly non-technical and very useful if you plan to do upgrade work yourself or direct the work of others.

Technology We Use

California Home Energy Efficiency Rating Services (CHEERS) www.cheers.org. This is the non-profit, public benefit organization established in cooperation with the state that is responsible for training, testing, and supporting, and providing quality control over the work of energy analysts certified to work in the state, including our analysts. They also provide an online Registry service that we use to calculate the cost effectiveness of potential home upgrades. Our analysts may also be certified to conduct other types of energy audits by other organizations as well.

Energysoft www.energysoft.com. This company developed the software we use to model the energy behavior of your home. It is based on energy analysis software developed by the U.S. Dept. of Energy.

Energy Conservatory www.energyconservatory.com makes the Minneapolis Blower Door test system we use to determine a building's leakage rate, the Minneapolis Duct Blaster system we use to determine duct system leakage rates, and the DG-700 manometer we use to make calibrated pressure measurements when appropriate.

Energy Efficiency Ratings of New Homes

Many new homes are now being built to one of the green home standards listed below, and some local building departments are beginning to require them. When you are in the market for a new home, consider a green home meeting one of the standards. It is sometimes possible to bring certain older homes up to these standards and qualify for one of these distinctions.

Build It Green's "Green Point Rated"
<http://www.builditgreen.org/guidelines/residential>

U.S. Green Building Council's "Leadership in Energy and Environmental Design's (LEED) for Homes"
<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=147>

U.S. Environmental Protection Agency (EPA)'s "Energy Star Homes"
http://www.energystar.gov/index.cfm?c=new_homes.htm [index](#) national

www.pge.com/myhome/saveenergymoney/eebuyersguides/newhome California

Other

City of Santa Cruz Climate Action Program
www.30x20.org/
Collette Streight, Climate Action Teams Program Coordinator
Department of Planning and Community Development
809 Center Street, Room 107
Santa Cruz, CA 95060
Phone (831) 334-1478
cstreight@yahoo.com

Association of Monterey Bay Area Governments
Energy Watch Program
www.ambag.org/programs/EnergyWatch/resid.html

Single-family and Multi-family Residential Direct Installation Program:
Energy efficiency experts are going door-to-door in some neighborhoods to directly install Compact Fluorescent Lamps and interior hardwired lighting fixtures for qualified PG&E customers.
Homebuyers Program offers free home services to most residents in the AMBAG region.

PG&E
www.pge.com/myhome

You can schedule a pilot relight appointment and safety inspection online. Use the "My Account" feature on www.pge.com to sign up for online services. You can also schedule an appointment by calling 1-800-PGE-5000. PG&E no longer offers free energy efficiency inspections of homes, but they do offer free training to energy efficiency analysts like us, and energy efficiency education to consumers.

Pacific Gas and Electric also offers many programs and services to help its customers reduce their energy usage.

- Rebates and Energy Efficiency for Your Home www.pge.com/myhome/saveenergymoney/rebates - PG&E offers a wide range of rebates, from instant savings on lighting products to their appliance-recycling program, to help you save energy and money.
- Energy Analyzer www.pge.com/myhome/saveenergymoney/analyzer -The first step in achieving an energy-efficient home requires the understanding of where your energy is going. Is that 20-year-old refrigerator power hungry, or is it a matter of

proper insulation? PG&E has created this tool to help you get answers.

- Energy Saving Tips
www.pge.com/myhome/saveenergymoney/savingtips
- Energy Saving Programs
www.pge.com/myhome/saveenergymoney/energysavingprograms - Find out about PG&E's unique offerings to help conserve energy and money, and help the environment.
- Buyer's Guides
(<http://www.pge.com/myhome/saveenergymoney/eebuyersguides/>)- You know there are more energy-efficient products out there, but which ones are they and where can you find them? What products should you install if you're buying a new home or remodeling? Start with these buyer's guides to help you make the right decisions.
- Energenius Educational Series
www.pge.com/myhome/edusafety/teach/energenius/index.shtml - Teaches kids to use energy wisely and safely with interactive, engaging programs for grades kindergarten through eight.
- PG&E Climate Smart Program
<http://www.joinclimatesmart.com> offset your greenhouse gas emissions by paying a little extra on your bill.

Central Coast Energy Services, Inc.

www.energyservices.org

888-728-3637

A not-for-profit organization that provides energy conservation, consumer education & advocacy, home improvement, utility assistance, job training, and other services to people in need. They run the Home Energy Assistance Program (HEAP) in which applicants may be eligible for Weatherization Services. This program is available to renters as well as homeowners. Owners of rental property are not charged when these services are provided for their tenants. Serves Monterey, San Benito and Santa Cruz counties.

Don Lane Home Heating Index Calculation for Natural Gas Heating

Import data downloaded from PG&E

Account Number	Bill Date	Gas Usage (Therms)	Gas Charges (\$)	Total Charges (\$)
991968903	8/29/2008	31	\$60.00	\$102.20
991968903	7/30/2008	32	\$70.03	\$112.46
991968903	10/2/2007	36	\$51.34	\$115.01
991968903	6/30/2009	37	\$43.89	\$101.61
991968903	9/29/2008	38	\$61.50	\$109.67
991968903	8/2/2007	38	\$59.81	\$127.53
991968903	7/1/2008	42	\$80.58	\$136.31
991968903	10/28/2008	43	\$63.72	\$106.63
991968903	9/4/2007	44	\$62.62	\$139.00
991968903	10/31/2007	47	\$70.26	\$144.80
991968903	6/1/2009	50	\$54.52	\$112.93
991968903	6/2/2008	56	\$98.69	\$162.34
991968903	11/26/2008	65	\$82.45	\$130.36
991968903	4/30/2009	70	\$85.55	\$132.45
991968903	5/1/2008	70	\$120.13	\$172.05
991968903	12/3/2007	70	\$96.22	\$158.26
991968903	4/2/2009	78	\$88.73	\$139.35
991968903	4/1/2008	86	\$125.10	\$180.93
991968903	3/2/2009	106	\$126.39	\$186.70
991968903	3/3/2008	109	\$157.18	\$222.85
991968903	1/30/2009	110	\$148.06	\$201.64
991968903	1/4/2008	118	\$173.91	\$246.59
991968903	12/29/2008	120	\$142.07	\$196.98
991968903	1/31/2008	129	\$182.33	\$249.60

Rows 5- 28 must be sorted based on descending Gas Usage using Data | Sort

Monthly Baseline in Therms / Mo.	35.3	
Annual Therms baseline	388.5	
Average Price per Therm		\$1.42
Annual Heating Cost		\$551.09
Annual Heating Degree Days for location from www.degreedays.net		3400.00
Square Feet of Conditioned Floor Area of House		2600.00

Home Heating Index = BTUs/square feet/HDDs 4.39 *

Homes with HDD > 8 probably have cost effective energy improvements to be made.

Homes with HDD < 4 probably are energy efficient already.

* Another source gives HDD of 2600 for Home Heating Index result of 5.5.