

The Home Energy Audit Guide

Starter Evaluation Edition





This guide is intended for informational purposes only. No guarantees, expressed or inferred, are made with respect to claims, promise of money savings or property. The homeowner or reader is left to decide what actions to take, and assumes responsibility over their actions. Thus, any loss, be it monetary or with respect to property or injury to the owner / individual performing the action is not the responsibility of the author / publisher.

In other words, use common sense.

Information in this guide is the intellectual property of the author, energyaudits.net and Headphase Media LLC. © 2009. All rights reserved.



The Home Energy Audit Guide

Starter Evaluation Edition

By Dave Andersen
energysaverdave@gmail.com

Published by EnergyAudits.net & Headphase Media, LLC
<http://www.energyaudits.net> (<http://www.headphasemedia.com>)



Table of Contents

Preface.....	5
Energy Auditing for Beginners.....	8
Preparing for a basic audit.....	10
Materials List.....	12
Review: What did we learn so far?.....	13
Audit Basics.....	14
Audit sheet terminology and use.....	17
Review: Another look at the basics.....	20
Doing a Basic Energy Audit.....	21
Basic Energy Audit Tips.....	26
Review: Basic auditing.....	27
Getting the rest the data.....	28
Using the Energy Cost Workbooks.....	29
Review: The energy cost workbooks.....	31
Reading the Results.....	32
Review: Reading the results.....	34
Further Practice.....	34
Preparing an action plan.....	35
A little about advanced auditing techniques.....	36
Commonly Asked Questions.....	40
Appendix 1: Examining a sample energy audit and worksheet.....	42
The Audit.....	42
Home Energy Audit Quick Sheet (Review).....	49
Closing thoughts (Next steps).....	50
Acknowledgments.....	51



Preface

Let me start with a simple assumption:

You want to know where your money is going.

You balance your checkbook, have some sort of budget, and keep careful track of your spending. And you know where and how your money is being spent.

This is how most of us live.

Yet, I would estimate that well over 80% have little idea as to where or how our money is being spent when it comes to home energy.

With rising costs, its easy to say “I want to save money on my energy bills.” Everyone does. Everyone thinks their energy bills are too high.

The problem is no one really does anything about it.

Sure, you can run to the home improvement store right now and drop hundreds of dollars (easily) on some Eco-option appliance or buy into the latest energy saving craze. But will it really save you money? Will buying it save you the hundreds promised on the label?

Probably not.

The easiest way to save money is to not spend it. And the easiest way to save on energy is to not use it.

Of course, this isn't practical. You have to spend money, and likewise, you need energy in your home.



Without a doubt, the only foolproof way to save money on your energy bills is knowing where the energy is being spent in your home.

Why?

Because every home's energy usage and needs are different. It depends on you and your family, your house or apartment, your location, etc. Your house is different than your neighbor's house – even if it looks exactly the same. Your habits and needs are different than those of your neighbor.

Once you know what your energy needs are, you can determine whether or not they need to be changed. Once you see where energy is being used (and how much is being used) it is much easier to make simple changes that add up to a big savings.

And a one size fits all energy savings plan or guide isn't possible, given that every home and every situation is different.

An **energy audit** is the process of literally walking through your home and identifying where energy is being spent or used. Once you know where energy is used, it is much easier to see where it is wasted, not needed, or being used inefficiently.

Once you know where the waste is, or where there is inefficiency, you can take steps to reduce or eliminate the waste.

So, just to be clear: Don't spend a dime on any energy saving product, good, or service until you do an energy audit. You may just be wasting money on a product that will not save you money, or worse, you do not need.

This starter guide is a professional quality guide that will introduce you to the concepts of an energy audit, and will show you:

1. How to prepare for your audit
2. Some of materials you will need
3. How to do a basic audit



You will learn how to finely tune your home to make the most out of its energy consumption no matter where you live.

It is important to perform an energy audit at least once per year, though twice per year is highly recommended. This way, you can effectively see energy usage during the coldest and warmest months.

Evaluation
Copy



Energy Auditing for Beginners



STOP!



Before we even get started, don't even think about making another energy saving decision without first going through this book. Yes, its that important.

If you don't know where energy in your house is being used and possibly wasted, how can you possibly justify making energy conservation decisions? You're wasting time, and more importantly, money.

Evaluation
Copy



Preparing for a basic audit

After completing this section, you will be able to:

- ✓ Identify the steps in a typical energy audit
- ✓ Gather the materials together for a basic audit

Basic home energy audits generally take a couple hours, especially when doing one for the first time. It is important to block off this time and avoid distractions. The audit itself is not intense at all – but it does require a keen eye for energy usage and identifying potential “problem areas.”

The audit itself is a multi step process, involving the following:

1. Walking through the home and identifying energy usage
2. Examining potential problem areas to discover “hidden” problems
3. Determining the approximate costs of usage
4. Identifying usage patterns and potential energy 'problems' based on the data collected
5. Developing an action plan to reduce energy costs

If a 'professional' auditor from a contracting or construction company were to visit your home, these are the steps they would take. However, their focus would be much different.

Typically, they would only pay attention to potentially more expensive repair problems such as heating and cooling problems. And they would typically use expensive and elaborate equipment such as thermographic imaging devices and calibrated blower doors. They would almost always completely ignore electrical costs unless they directly related to heating and cooling.

The main reason for this is simple – it is how they really make their money. A contracting company that offers energy audits will find a problem and recommend one of their services – new windows, doors, insulation, furnaces, or a whole host of other expensive repairs.



Let me set the record straight. I'm not faulting contracting companies, energy companies or anyone else that offers energy audits. But I do feel it is important for every homeowner or person who rents to get a real sense of the energy usage in their own home. It is one thing for someone to tell you where energy problems are – and totally different (and worthwhile) to see and understand them for yourself!



Professional energy audits conducted by a contractor can cost between \$200 and \$1000, depending on the scale of the audit, and the equipment they will use.

Evaluation
Copy



Materials List

Don't go out and buy expensive equipment. Most of the energy audit can be done with household materials and supplies you probably already own.

Energy Audit Materials

- A clipboard or something solid to write on and a writing utensil
- The audit forms included with this guide, printed off for every room and the outdoors
- Common tools, such as screwdrivers, drill, etc.
- Calculator



Is this really all I need?

Yes. A basic energy audit involves more attention to detail and collecting data that is readily available to you. It takes advantage of your familiarity with your house more so than heat measurement techniques that professionals use.



Review: What did we learn so far?

It may not seem significant, but we actually learned some key concepts so far!

1. A basic energy audit is not hard, and only takes a couple hours of your time.
2. A basic energy audit only requires the most basic understanding of auditing concepts and tools.
3. You can save hundreds of dollars per year on energy auditing by learning to do it yourself.
4. There's no such thing as a “free lunch” when it comes to energy auditing. If a company is offering free auditing services, be on your guard.

Next....

Let's go over the basics of a basic energy audit



Audit Basics

After completing this section, you will be able to:

- ✓ Identify the important information to capture during an audit
- ✓ Understand how to note electrical and natural gas usage
- ✓ Understand the terminology used on the audit sheet
- ✓ Be able to place the needed information on the audit sheet

As I stated before, an energy audit is not difficult. It takes some time, but fortunately, you can complete the audit at your own pace and can even spread it out over several days if you need to.

The actual act of walking through the house / residence and identifying energy usage is the first step in an audit. So let's talk about what you will be doing while conducting your energy audit room to room.



It's important to physically walk from room to room when doing the audit. Do not rely on memory! You will forget items that are rarely used or 'dormant' at the time of the audit. You will also fail to gather important information such as power rating or consumption.

Don't forget – if you need to split the energy auditing of rooms between several days, feel free to do so. You do not have to do every room in the same day! Chances are, your energy usage is consistent from day to day (during the season you are in) anyway.

Recording usage of electricity

As you walk through each room of your house, you will be noting every appliance and item in the room that uses electricity. If it is plugged in, it needs to be counted – even if it isn't turned on. If it isn't plugged in, but can be, it needs to be taken into account. Anything that uses electricity needs to be accounted for.



This means lights, computers, alarm clocks, TV's, blenders, fans, toasters, aquariums, lamps, pumps, baby monitors, etc. If in doubt, count it.

Light bulbs typically have the consumption printed on the glass, or on the base. Appliances have the information either printed under the item, or on the back near the power cord. They may also have the information you are looking for on the plug or separate adapter (transformer) that is between the appliance and wall outlet.

If you do this on a room to room basis, you are sure to uncover things you take for granted or forget about.



Amazingly, the actual “cost” or consumption of energy by an appliance doesn't necessarily coincide with the label, or power rating given. There are many reasons this might be – electrical inefficiency due to age or condition of the appliance, difference in recommended operating temperature, small power surges or uncalibrated alternating current, component failure, etc.

For our purposes in this guide and for the sake of your sanity, simply take the measured or rough calculated amount as the actual consumption. If you really want to know how much power your appliances are drawing, you can find the information in the Premium Edition of this guide.



What if I can't find a sticker with the rating?

Check again at the bottom / near the cord. Some appliances have the sticker on the back. If you still can't find the rating, either in watts or current in amps, get the model number and do a search online to see if you can find the technical specifications from the manufacturer.

Recording usage of gas

In every room, make note of the gas appliances. There are far less gas appliances in a typical home than electrical ones, so this is a slightly easier step.



Remember, there are often times appliances that use both gas and electricity. Make sure you capture both!



Can I do an audit with propane or heating oil instead of natural gas?

Yes!. However, the calculations performed in the worksheets (which I'll introduce to you later) won't be accurate because they are calibrated for natural gas. However, you can certainly get an idea of your overall usage. Additionally, while the costs may not be accurate, they can serve as a comparison point.

Vital Information to capture

When doing the audit, it is important to note the following information:

- For gas appliances, the rating in BTU (British Thermal Units)
- For electrical items, the power consumption in Watts (abbreviated as 'W' or 'w')
- If an electrical item does not have the power in watts, note the Voltage and Current. These are typically listed as V and A. (Example: 120v, 0.8A) In some cases, the volts may not be present – just the current. Assume the volts are 120v, typical for a household in North America.*
- Windows / doors that are in the room (and the direction they are facing)

*There are exceptions. Heavy appliances may be plugged into a 240v plug. Also, if you are not in North America, your current and voltage will be different.



Audit sheet terminology and use

Here are the terms you will find on the audit sheets you will be using:

IAT: Indoor Air Temperature, of the temperature of the room at the moment. You shouldn't use the temperature on your thermostat as the IAT – use another thermometer for accuracy. Also, keep in mind the thermostat may not give accurate temperatures outside the room it is located in. IAT is very important for advanced audits, which are covered in great depth in the premium version of this guide.

OAT: Outdoor Air Temperature, or the air temperature outdoors at the time of the audit.

Insulation Levels: When possible, record the R-Values of insulation. Again, this is vital for advanced auditing, covered in great depth in the premium version of this guide.

Surface Temperatures: Ideally, you would use this field in an advanced audit. Record temperature differences, ranges, and approximate locations for outer facing walls when indoors, or surface temperatures of outer walls. For a basic audit, you can skip this field.

HVAC: Stands for heating, ventilation, and air conditioning. Section holds information about heating, cooling appliances, and vents / ducts / registers. Almost anything that has to do with heating or air conditioning goes here.

Furnace temp: The temperature of the forced air / heated pipes coming from the furnace / boiler. Use caution when measuring the temperature – it will be hot! (Again, we use this in advanced auditing.)

A/C temp: The temperature of the forced air coming from the A/C unit. (Again, we use this in advanced auditing.)

Lights: Section used to hold all the information about the lighting in the room.



Appliances: Section used to list every other gas / electric item in the room that does not have to do with lights or HVAC. Thus, the section can contain TVs, blenders, toasters, microwaves, computers, etc.

Windows: Record information about the windows in this area. Typical measurements are the visual quality (damaged, good condition, etc), the direction they are facing, whether they are covered (curtains, blinds, etc), and dimensions. When doing an advanced audit, this section also holds test results about each window.

Doors: Much like the windows section, the “Doors” section holds information about all the doors leading to the outdoors (or an unheated environment such as a garage). Again, direction, visual inspection, dimensions, and test results in advanced audits are recorded here.

Notes: Holds miscellaneous notes you may need to remember about the room. Ideally, its a free form field that is used to hold your thoughts or observations.

Recommendations: This field is filled out after the audit is complete. *You do not fill this out while auditing the room.* Ideally, you would examine the results, make some calculations, and go room by room to make changes.

BTU: British Thermal Units, a unit of heat measurement. Natural gas appliances measure their heat output in BTU.

ccf: Unit of natural gas measurement. Stands for one hundred cubic feet.

The bottom of the sheet has important notes, calculations and hints that you can use while walking through the rooms, or while performing calculations after the walk through is completed.



Do I need to use your audit sheets?

No, but I strongly recommend it for the following reasons:

- ✓ they were developed to organize and gather all the required information
- ✓ they are easy to use and understand
- ✓ they provide a basis for repeatable, and detailed tests which can be compared year after year

However, if you feel more comfortable using another sheet, or prefer a blank piece of paper, that's fine. Just make sure you gather the required pieces of information. Otherwise, you'll have to go back and take more readings!



If this is a basic audit, why is the audit sheet cluttered with information I'm not collecting?

I thought about perhaps making a different audit sheet for the starter edition, and keeping the original audit sheet for the professional edition that contains the advanced techniques. I decided against it for selfish maintenance reasons. Also, just because you aren't learning or collecting some piece of data now doesn't mean that its not important – or you won't in the future. It's better to leave it in there for the time being and just leave it blank. If you're concerned about running out of space, attach another piece of paper to it with the additional data you collect. For most homes, the audit sheet as enough space to accommodate items / appliances in a moderate to large sized room.



Review: Another look at the basics

We're oh so close now. Next up, we're going to get our hands dirty and do an actual energy audit. But first, let's take another look at what we've learned.

1. We covered the information we're going to be capturing during our auditing walks.
2. We also covered how to get the information that is vital to a successful energy audit.
3. We looked at the terminology used on the audit sheet we'll be using, and how to basically fill it out.

I wanted to take a quick moment to point out how absolutely critical it is that you get the correct information during the audit and refrain from making judgments while auditing. It is far too easy to cut an audit short because you find “easy” repairs that you can be making. Do not do any repairs while auditing – make your notes, and finish the audit. Then, go back and do your repairs.

Next...

Roll up your sleeves, we're going to do an audit!



Doing a Basic Energy Audit

After completing this section, you will be able to:

- ✓ Complete basic energy audit for your home
- ✓ Derive basic energy assumptions based on your findings
- ✓ Find “hidden” energy holes commonly missed

Now that you know the basics, its time to start with a basic audit. Pick a room to start in, pull out your first audit sheet, and get started.

Start with electricity since it is typically more abundant in the room and somewhat easier to get the ratings or energy consumption.

1. Walk through the room and make note of every single electrical appliance or item in the room one at a time.
2. For each item, look for the power consumption, in watts (w). If (w) rating isn't available, note the volts and amps (V and A, respectively). If the volt rating isn't available, note the amps.
3. If possible, estimate the number of hours per day the item is used.
4. Repeat for every electrical item in the room. Place the findings on the audit sheet under the appropriate section.



How important is the time / hours used?

Turns out its pretty darn important. Electrical usage in terms of home energy has two components: the energy draw or power consumed and the amount of time it consumes the power. If either one is zero, then no energy is used. If you have an appliance but its never used (and not plugged in) it doesn't cost you anything. Likewise, if you use something all the time but it doesn't consume power, it doesn't cost you anything. Your electric bill is based off the amount of time you



use power.



How close do my time estimations need to be?

Depends how accurate you want your cost analysis to be. Usually, rounding to the nearest hour is best.

Now, it is time to look for the gas appliances.

1. Just as you did with the electrical items, look for gas appliances in the room. Typically, there are less gas appliances in the room than electric.
2. Note the item and the heat output, measured in BTU. Usually the number will range in the thousands to the hundred thousands for larger furnaces.
3. If possible, estimate the number of hours per day the appliance is used.
4. Most natural gas appliances also use electricity. Note the electric consumption in watts as well. Make sure to make notes in the appropriate section.

Let's move on to windows and doors. As part of a basic energy audit, you should make the following measurements for each window:

1. Check the condition of the window, the window pane, moulding surrounding the window, and the operability (does it open, close, stick, rattle in wind, etc.). Make notes of each one.
2. Is the window covered by blinds or curtains? Are they heavy, or in good shape? Do they completely cover the window?
3. If the audit takes place on a windy day, check for obvious air leaks around the window.
4. Repeat the same basic process for doors. Check the operability, check for drafts, visually inspect the moulding, etc.
5. Makes notes of all your findings in the appropriate section.

After completing all the rooms in your house (including the basement and garage), you may also want to venture outside and continue the walk through outside.



1. Follow the same audit procedures outside as you did inside. Basically, treat the area surrounding your home as another room. Look for electrical appliances and devices. Lights, pumps, lamps, garden equipment, grills are all examples of electrical and gas appliances outside.
2. Make note of each one with the appropriate information as you did previously for electricity and natural gas.

While outside, you will also want to look for several items.

1. Check the walls / siding for visible damage. Water damage, wind damage, vandalism, poor construction, or accidental damage are common.
2. Check for gaps and holes where pipes and wires may exit or enter the structure.
3. Check the condition of windows and doors that face the outdoors *from* outside. Note visible damage.
4. Scan the foundation for large cracks or holes and water damage.
5. If possible, look at the gutters. A damaged gutter may have damaged your home's energy envelope by leaving holes in the structure.
6. Check the caulking / weatherstripping on windows. You will also want to check the flashing around doors and windows (if your home is sided).



The outside of my home seems fine. Am I missing something? Am I doing something wrong?

A visual inspection of a home from the outside may or may not reveal energy problems. You might be missing something, but at the same time you probably aren't doing anything wrong. This is because outdoor audits can be tricky with a lot of hidden nuances. Unfortunately the only way to find a lot of the problems is by looking at the house from a different point of view. I cover this in greater depth in the professional edition of this guide.



Here's an example of an easy outdoor observation that is often missed. Notice the gaps between the faucet/outlet and the siding. These should be noted on the audit sheet.



Check out this closeup of a gap between a sump pump pipe from a basement to the outdoors. Believe it or not, that “orange glow” is actually the lights inside the basement! Amazingly, the homeowner had no idea this problem even existed – until he did an energy audit...five years after he bought the house!

Right now you are probably telling yourself “That's easy! Why didn't I think of that before?”

And you're right – the basic audit is easy. But it is incredibly powerful. By seeing where you spend energy, you can identify potential savings areas rather easily. In fact, you probably see where you can save on some areas right now.

Hold on! Don't be tempted to rush in and do anything just yet. We'll be using your data in a little bit when we put it into the energy workbook.



Basic Energy Audit Tips

- Be meticulous and detail oriented. Record as much information as possible on the audit sheets. If needed, you can print two or more sheets for a room, or just use the back.
- Carefully check the power ratings.
- Many appliances have the power ratings in hidden places. For example, a counter stove top may have the energy information on the underside of the unit. A free standing range will most likely have it on the back. Most incandescent light bulbs have the information on the glass globe, compact fluorescent bulbs have the information near the base.
- If there is only a rating in amps, carefully write the number down. It is easy to misread a period, which leads to vastly incorrect energy readings. In other words, there is a world of difference between .15 Amps and 1.5 Amps (in fact, about a 162 watt difference!)
- If finding a reading for an appliance is not feasible (i.e. Too heavy to move, sticker was destroyed, can not find the information, etc.), try to get the model number and make of the unit. Search the Internet for the wattage or BTU output of the unit.
- Older units, especially larger appliances that rely on natural gas, lose efficiency as they get older. The ratings or output of heat assume near 100% efficiency unless otherwise stated. That means 100% of the energy is being converted. This is never the case. For basic purposes, keep this in mind.

However this may help to answer the question on why you may have to run something like a furnace longer to achieve the same result as it gets older.

- Items like refrigerators may need to be monitored to determine how often they turn on, and for how long. For most other appliances, a best guess for duration is fine.
- Remember, just because an item is “off”, energy may still be used. Common examples are VCRs, cable boxes, and ovens. All these items typically have clocks or are in standby mode. They are still consuming energy, albeit a smaller amount. Make sure you note this.
- In general, if something looks odd or not right, you are probably correct. Make note of it. If necessary, you can revisit later.
- In general, it usually takes about 10-15 minutes per room to perform an audit. The rooms with the most items in them are usually the kitchen, living room and basement (or laundry room.) The rooms with the least amount of items are bathrooms and hallways.



Review: Basic auditing

Believe it or not, the basic audit is as simple as that. Yet, many of these items would be completely missed by a professional auditor because of their scope, as I mentioned earlier in this guide.

1. We walked through each room of your house and noted the electrical and gas usage, on a room by room and appliance basis.
2. We noted the condition and other “measurements” about windows and doors in the room.
3. We also made assumptions and estimations about daily and average usage. These will become absolutely crucial when we start analyzing the data!
4. We stepped outside and took a closer look at your house or apartment. Hopefully (or not, depending on how you look at it) we discovered some interesting “holes” you never knew were there.
5. We covered some basic tips on doing the most effective energy audit possible.
6. Again, a basic energy audit isn't hard! It takes about 15 minutes per room, most of the time even less than that.

Next....

Okay, we have the data. Now let's sit down and do something useful with it!



Getting the rest the data

By now, you've gathered quite an impressive array of information about your home's energy usage. You've documented all the items in your home that use electricity, and everything that uses natural gas or another fuel source.

Now, let's start to put the pieces together.

First, we'll need to convert any electrical device that isn't measured in watts. The simple* formula for doing this is:

$$\text{Watts} = \text{Volts} \times \text{Amps}$$

** The actual formula is volts x amps x length of item providing resistance, or $v \cdot i \cdot k$.*

So, if a device uses 1.8 amps and a normal household current of 120 VAC:

$$\text{Watts} = 120 \times 1.8$$

or

$$216 \text{ Watts}$$

Note this on the audit sheet.

Once all the data is correct, it's time to enter it in the energy cost workbook.

At this point, make sure the energy audit sheets are filled in as much as possible.



Using the Energy Cost Workbooks

After completing this section, you will be able to:

- ✓ Use the information in your audit sheets to approximate your energy bills
- ✓ Use the same information to estimate your potential savings
- ✓ Learn how to manipulate the information in the energy cost workbooks

Now its time to introduce the energy cost workbooks. These interactive spreadsheets were designed to help you find the approximate cost of all your appliances in your home on a daily and yearly basis. And honestly, they are quite amazing because as we'll see in a bit, you can manipulate them to find answers to your “what if...” questions!

Before you open the worksheet and have a look around, you'll want to gather the energy audit sheets you just filled out, as well as your last gas / electric bill. You will need to find the cost per unit of energy, the billing cycle, and the delivery service charge per unit of energy. Typically, these are on your utility bill itself.

When entered on the sheet, these figures are used to find the current cost of energy usage in your home.

The spreadsheet is fairly self explanatory, but let's take a few moments to go over a few things.

Upon opening the first sheet, labeled 'Electricity', you will notice there is a sample cost / billing cycle / delivery charge already filled in for you. If you don't have your bills in front of you, change these values later at your convenience. Remember, though, you will not be able to accurately gauge your costs until you get these figures.

1. Go through the audit sheets you filled out, and select an electrical appliance.
2. Select the appliance or type of appliance using the drop down menu in the “Appliance” column. (If you put your cursor in the appliance column, a little drop down arrow should



appear to the right.)

3. Enter the number of appliances for that type. (Typically used for light bulbs, or appliances that can be grouped together in your house. In other words, ones that have the same power consumption (watts) and duration.
4. Enter the number of hours per day the appliance is used.
5. Notice the daily cost, cost per billing cycle, and yearly cost is automatically determined for you.

Use the top form (Daily Usage) for appliances or electrical items that you use daily. It is fine to estimate. For example, if you use some lights in your house for a few hours a day most of the time, it is fine to simply say that you use them every day and make the adjustment in hours.

So, if you use a set of 60 watt lights 5 days a week for 5 hours, you could mark it in the daily usage table as 3.5 hours a day.

However, there are some appliances that you simply do not use every day. Place these in the “Seasonal / Occasional Appliances” Table.

The process is then the same as above.

1. Select the appliance from the drop down menu under the “Appliance” column.
2. Enter the number of appliances and the watt consumption.
3. Enter the number of hours per day.
4. In the number of days per month column, enter the approximate number of days per month you use the appliance.
5. Finally, fill out the number of months you use the item.

The process is exactly the same for the “Natural Gas” worksheet (Tab). Just repeat it as you did for electrical.



At the bottom of each tab, you will find a section called “The Bottom Line”.

This section adds up every cost and presents you with a yearly estimate, as well as a monthly / billing cycle cost for energy.



The energy cost workbooks and energy loss worksheets give you an advantage not even many professionals have! Very few will be able to present real, personalized cost saving data with the ability to see how much your bills will go down based on just a few simple energy changes!

Review: The energy cost workbooks

Now we're starting to do something with all the data you've collected! This is where you take all the data you worked so hard to collect during your audit and begin to assign and see real costs associated with each appliance and its usage.

1. After entering some basic information from the audit, you can now see and approximate how much everything in your house costs to use and run.
2. Not only can you see the appliances individually, you can also see how much everything in your house costs yearly, giving you the “bottom line”
3. You also saw how much natural gas appliances cost to run per billing cycle and per year!

The power of the workbooks and calculators is not only in what you see you're spending now on energy, but also telling you how much you could be *saving*!

Next....

Let's take the worksheets a step further, find areas of savings and start saving money!



Reading the Results

After completing this section, you will be able to:

- ✓ Read the results of your energy usage and identify potential savings areas
- ✓ Create a money saving energy plan based on your home's current energy usage

As you enter the results of your basic energy audit into the worksheet, the numbers will start to add up quickly. Even small costs daily add up to a significant yearly sum. The workbook makes it easy to see plain as day.

The results on the far right (Yearly Cost per item) will give you the most insight into what is really costing you money, and will provide clues into what you can do to reduce your energy bills.

Use the notes line to make comments on where the appliance or item resides, or ones that may need your attention.

When you are finished entering the data, you will clearly see exactly where your energy dollar really goes.

In general, the higher the yearly cost, the greater concern. Most items you can certainly do something about. For example, if your computer is costing you over \$100 to run, you may consider using it less, or perhaps buying a more efficient monitor.

You can also use the spreadsheet and the calculations to experiment with money saving plans.

For example, lets say that you want to save 10% on your yearly electrical consumption. You can try reducing usage times, or entering lower energy consumption results until you get the figures you want. Then, put your plan into action.



It is important to actually write your plan down somewhere. Keep the goal in mind. This approach has several advantages:

1. You are far more likely to succeed if you clearly define a goal and write it down.
2. You are also many times more likely to succeed if you see the “proof” that you are actually saving.

I understand a lot of times the reason people don't do the “right” thing when it comes to saving energy is because there is a clear lack of “evidence” there to support doing the “right” thing. In other words, I can tell you that turning off a light saves energy. And you know it to be true.

But...if I told you that turning off a particular light saves \$23 a year, you are far more likely to take action and remember it! That is because there is sufficient evidence to support what I tell you. And not only that, you see the evidence and how we arrived at the conclusion! You did the calculation, and “see” the savings.



Wait a minute! What about the window observations I made earlier?

When you made window measurements during the audit, you may have uncovered intrinsic or obvious problems. This is as far as a basic audit goes. For example, if you discovered a gap or crack, and note it, then go back and seal it. If a window is in bad shape, think about replacing it. It is possible to assign a cost to the window problem, but this requires some advanced techniques covered in the professional edition of the guide.



Review: Reading the results

Practice, practice, practice my friend! The worksheets and calculations were done in the easiest, most streamlined manner possible to provide you unparalleled flexibility and ease of use while still getting the job done accurately. That sounds a lot like a sales pitch...and I'm sorry that. The truth is the worksheets and calculators were designed with you mind. I tried to make them as easy as possibly to use, and I'm very proud of them.

1. You learned how to think about manipulating the data to “see” savings opportunities
2. You also found out how to read the bottom line, and find areas of savings based on your cost.

Further Practice

If you really want to unleash the full power of the calculations and the workbook, try some of these exercises using the appliance readings in your house.

1. Which is cheaper, making a pot of tea in the microwave or on your stove top?
2. What would happen if you used your lights 25% less?
3. How much would you save if you changed all your lights to Compact Fluorescent Bulbs? (CFL)
4. How much of a difference would it make if you watched 1 less hour of TV a day? A week?
5. How about spending 1 less hour a day on the computer?

Hopefully these examples get you thinking about different ways to save. The possibilities are truly endless, and all are guaranteed to work in your home and in your situation – because you are actually changing the “bottom line.”



Preparing an action plan

Now that the audits are done, and the data is gathered, you should begin to see potential areas for savings. Depending on where your energy needs lay, you can begin to form an action plan.

The plan does not have to be anything formal, though I do recommend writing it down. There are several reasons for this. First, you are less apt to forget a plan in writing than a plan you just come up with off the top of your head. Second, you can measure success against a written plan. There is usually a clear “success” or “failure” measurement when it comes to energy savings action plans.

So, how do you write a good, specific energy action plan?

There is no clear, one way fits all. After all, each home and each situation is different. But there are some items you should include in your action plan.

First, address the biggest energy wasters. Write down what you've observed or calculated, and what you plan to do about it. So, if we find that TV costs are very high on a yearly basis, we note the amount of time spent watching the TV and the cost of that activity. Then, we come up with a goal to reduce that cost. In the case of energy loss, we can note how much energy is being lost through a faulty window, for example, and what we plan to do to mitigate that loss.

The idea is to address every single area of energy usage where you see the opportunity for improvement. In the coming days and weeks, put that energy savings plan into use.



Did you know...developing an energy savings plan is now easier than ever, thanks to the “Developing an Energy Savings Plan” book – included with this kit!



A little about advanced auditing techniques

By now, you should have a pretty good grasp about energy usage in your home. The basic audit is enough to get you started, for sure.

In fact, a basic audit is all many homeowners need to “jump start” their energy efficiency efforts. The amount you save, of course, is completely dependent on your situation and costs. You can see the costs and savings, though, in your workbook.

As I mentioned earlier, a lot of professionals won't even touch or bother with what you did in the basic audit. Aside from not helping their “bottom line”, they also have no idea of your usage of each appliance. For example, if a professional were to come in and ask you how much you used each light in your home, then how much you use the oven, the stove, the washer, etc...you'd get pretty darn tired of it quickly.

You're in the best possible position to do this kind of audit. And when you do, usually the results you get make it clear to see where you can save the most money.

Still there is something to be said about a professional audit. Most professionals practice what I call “advanced” auditing. Using techniques that require more training and knowledge, they help a trained auditor “see” energy problems that are absolutely invisible to the naked eye. Through careful measurement and observation, the auditor can even present an estimate as to how much energy is being lost. This, then, can translate directly into a cost to you.

This information is absolutely invaluable, because as I stated last section, if you see how much you are spending or losing, you are much more likely to do something about it.

We won't get too much into advanced techniques, as this is covered in full detail in the “professional” version of this guide. I did want to take a few moments to expose them to you, so you can find out if the information gathered by the professional audits is of value to you.



Note: Professional Auditing techniques aren't too hard, but they require more practice and effort than a basic audit. Still, they are all considered do it yourself type jobs.

In the Professional version of this guide, I cover the following advanced techniques. I'll explain what each one of them is designed to do.

1. Room Blower Testing
2. Thermographic Inspections
3. Furnace / HVAC delivery efficiency
4. Energy loss in ducts
5. Insulation
6. Outdoor tests
7. House orientation and windows

Room Blower Testing

This simple test will pressurize your room to exaggerate gaps, cracks and seals that are leaking air and thus, energy. A professional would come in and actually place a large, industrial fan (called a blower door) which would systematically force air to circulate in such a manner that they can “see” energy leaks. I show you how to achieve relatively the same effect for much, much less than the cost a pro would charge.

This test is ideal for testing the areas around windows and doors.

Thermographic Inspections

An auditor would typically come in and use an Infrared Camera to “see” heat differentials on



all your walls, ceilings, floors, etc. The cameras that do this are crazy expensive – ranging in the thousands of dollars range. (Now you understand why pros charge so much for their services!)

I'll show you how to achieve the same results their fancy cameras would, for much much less. More than that, I'll also tell you how to read the results you get.

This technique is perfect for anyone who wants to see if their walls are under-insulated, if there are problems with a wall, if you suspect water damage or moisture problems, etc. For example, a common problem found in many homes is insulation settling, causing gaps or insulation voids. As a homeowner, you'll never know this is happening. A thermographic inspection, however, makes it easy to see.

Furnace / HVAC delivery efficiency (and duct efficiency)

When heat (or cooled air) leaves your furnace or A/C, it is at a certain temperature. In most homes, by the time it reaches the rooms, it is at a different temperature. This means heat is lost. When heat is lost, you lose money. It really is as simple as that. I've developed tests and calculations to help you find how much you're losing, and translate that into a dollar amount. Then, I give you ways of stopping or minimizing the loss.

If you have an unheated basement, or if certain rooms just don't seem to heat (or cool) right, you'll want to check this one out.

Insulation

There's a real easy way to check for insulation behind a wall without tearing out a section of the wall. I'll share it with you...in the professional edition of the kit.

If you've ever wondered if a wall was insulated or not, you'll want this one.



Outdoor tests

For the most part, a lot of our basic auditing was done indoors. But considering that the outside of your house (or apartment) often bears the brunt of weather, it is the first barrier of defense against heat loss. Unfortunately, many times there is energy “damage” that can't be seen. The sad part is when this happens, it costs you money.

In the professional edition, I'll show you how to apply what you've learned to examine the outside of your residence.

House orientation and windows

Chances are you are losing a lot of energy through your windows. Also, your home may be more susceptible to heat loss (or heat gain) depending on how it is oriented or “placed”. Depending on your situation, you may be able to take steps to help minimize the heat loss (or gain) based on the position of your house.



Why aren't these techniques in this book?

None of the advanced techniques are in this book because they require a little more knowledge and are beyond the scope of a starter manual. The starter guide (this one) was designed to get you up and running in less than an hour, arming you with all the information and know how you will need to find basic energy problems in your home or apartment. The professional edition contains advanced auditing techniques that take a little time to master, and involve more complex equations and calculations. Still even these are made easy with more intuitive worksheets and calculators.

I'm presenting them to you to give you a flavor of what is in the professional edition of this guide, in case you wanted to upgrade.



Commonly Asked Questions

How is this information different from a professional energy audit?

First, professional audits usually cost money, even in the hundreds of dollars range, followed up by hundreds or thousands of dollars in repair. The audits you do are free.

Second, professional audits done by private companies usually focus on 'big repairs' items such as heating and cooling. That means they will inspect doors, windows, your furnace, A/C, etc. That is excellent, and you certainly need that information. However, they usually do not pay attention to the other part of your energy bills – typical usage. When you do an energy audit yourself, you 'fill in' that information to get a complete picture. Of course, given time and materials, you can attempt to somewhat duplicate a professional's results.

Third, you should do an energy audit once or twice a year. Inviting and possibly paying a professional to do this isn't always practical. It's nice to have the knowledge so you can 'do it yourself'.

Fourth, once you know the energy situation in your home, you can easily figure out how to resolve it. It is more effective for you to see the problems, because it tends to motivate better than taking the advice of a stranger who has seen your home only once.

How can I find the time per day it takes to run appliances like a fridge or air conditioner?

Aside from staying by the appliance and keeping a detailed log for 24 hours, there is another way. You can estimate the time.

To do this, all you have to do is observe the appliance, either directly or indirectly for a set time, perhaps half an hour to an hour. Then you can make a best guess by multiplying the time the appliance runs for by 24 or 48, depending on whether you use an hour or 30 minutes, respectively.

So, for example, if you notice that your fridge runs for about 10 minutes an hour, you can estimate that your fridge runs for 240 minutes, which is equivalent to 4 hours.

But, that's assuming your fridge is used the same way. At night, or during off peak usage, it runs less than that. This is especially true when it comes to air conditioners. For the most part, they run less at night and more during the warm hours of the day.

So, for a more accurate count, we can simply take two measurements for a smaller time, say, fifteen minutes.



At night, the A/C turns on about once every 15 minutes for only about 3 minutes. This is probably the case all night, for about 10 – 12 hours. To make things easier on us, let's assume 12 hours. The other 12 hours it is used a little more, every 15 minutes, it may be on close to ten minutes on a hot day.

So, for night, we multiply 3 by 4 (since 15 x 4 is 60 minutes, or one hour) to get 12, then 12 x 12 hours to get 144. Now, 10 x 4 is 40, and 12 x 40 is 480. Now we just add up the minutes, 144 plus 480 to get 624, which is roughly equivalent to 10.4 hours per day.

Remember, the main point here isn't necessarily to predict, on the dollar, your energy bill. It is to help you gauge your energy usage. Bottom line, as long as you are consistent, measure and estimate with figures that make you feel comfortable.

Can I save 25% on my energy bills with just a basic audit?

It is possible. The amount you save depends on your home, your situation, where the energy is really going and how you plan to lower your bill. The basic audit attempts to identify energy usage, while the advanced audit is more about finding energy loss (usually in the form of heating or cooling).

If you just do a basic audit, the obvious steps to take are reduce usage. If you can find a way to reduce energy usage, you will start saving. Now again, the amount you save depends on your situation, but even a savings of 5 – 10% is outstanding for a first try. Remember to devise an energy saving plan based on your audit results!

I'm stuck. I have a problem I can not figure out while doing the audit. Now what?

I'll be glad to try and help you out. Email me at energysaverdave@gmail.com.

Do I really have to do all the things in this book?

Absolutely not! The information in this book is *optional* for you to use as needed. If you only see the need to do a very basic audit on a few rooms where you think the most energy is wasted or used, then feel free. The audits and instructions are just *tools* for you to use in your fight against high energy bills. The more exploration you do, the more areas you may find to save.



Evaluation
Copy



Appendix 1: Examining a sample energy audit and worksheet

The information and instructions should be relatively straight forward. However, I've always found the best way of learning something is through practice and real world examples.

So, lets take a look a real world energy audit.

The Audit

This audit was conducted in an older house that recently had a second story added, though it was a rather cheap job. The downstairs had been neglected, and the new owners decided to fix it up. They spent years painting and remodeling the house, however, their energy bills climbed higher.

Let's start by going room to room in the provided audit sheets:



Notice how not every single field was filled in – yet I would call this a pretty good basic audit. It captured basic energy usage in the room during the given season – in this case, summer.

Now, lets analyze the cost workbook, named cost workbook example 1.xls

We'll start with electricity. Scrolling to the far right, we get an idea of the most expensive electrical appliances. The refrigerator, halogen lamps, and computer stick out. The incandescent lights also make up a decent portion. So now we know what the most expensive appliances are. What do we do about it?

Well, reduce usage is one option. In this house, reducing computer usage by just a couple of hours will begin to have an impact on the bottom line. But an even bigger savings could be realized by swapping out the incandescent lights for CFLs. In fact, we can save over \$150 in this house just by doing that,

We could replace our fridge, but that is expensive. Better off checking the seal and looking into a tune up or cleaning. Doesn't hurt to use it less, either, or practice safe fridge care. You can find information on these tips in the accompanying guide, “The complete guide to energy saving tips.”

Now, let's move onto natural gas.

Surprisingly, the stove does not cost as much per year as originally thought. The hot water heating, however, is a major cost. And of course, there's the furnace.

First, lets cover the hot water heating. Over \$400 is a lot per year on just warming and storing hot water. Turns out this home's hot water heater is in an unheated basement. Its best to insulate the delivery pipes and possibly insulate the heater itself. Turn down the temperature and of course, only use hot water when needed. Again, more tips are in the accompanying guide.



The biggest cost, as expected, is the furnace, weighing in at over \$1000 per year. All signs point to a heating problem in this house.



How do you know there is a heating problem?

Based on the evidence gathered, the cost appears to be higher than normal or average. Additionally, the visual inspection of the heating system cast immediate suspicion. We can confirm these suspicions with some advanced auditing techniques found in the professional edition.

Next Steps

So what did this first audit teach us? We spend most of our money in electricity on incandescent bulbs and a potentially energy hungry fridge. If we were to do some advanced audits on the home, we'd also find insulation and heating/cooling problems that stem from older and inefficient equipment and inadequate insulation levels.

Now that we know where the problems are we can take steps to correct them by developing an energy savings plan centered around them.



Home Energy Audit Quick Sheet (Review)

- ✓ Do It Yourself Home Energy audits are not only easy, they are also highly effective when done correctly
- ✓ An energy audit should be done at least once per year, but I'd highly recommend twice per year.
- ✓ Carefully walk through your home and identify all devices and appliances that use energy. Note the amount of energy used along with how often the device is used daily.
- ✓ Generally speaking, 75% of your light bulbs should use CFLs. (exceptions include dimmers, those exposed to direct moisture, ones without adequate ventilation, etc)
- ✓ Carefully inspect the outside of your house for damage and potential energy 'holes'



Closing thoughts (Next steps)

I hope you can see the incredible power of the information you are holding in your hand right now. Even the simplest audit done in a weekend has the amazing potential to save you hundreds of dollars per year. When combined with the energy calculators, you can quickly see your savings add up.

Look, the honest truth is you CAN reduce your energy bills through simple but diligent work. Once you finish the audits, fill out the sheets, and plug the numbers into the calculators, the problems become clear as day.

Next, armed with this knowledge, open the “developing an energy savings plan” book. It will walk you through, step by step, how to create a good money saving energy plan that is perfectly customized for your home.

If you're serious about getting the whole picture of your home's energy usage, I'd also highly recommend the professional edition of this guide and kit. It contains detailed information on all the advanced techniques we've covered, contains more examples of workbooks and audits, and also has many more innovative energy calculators that give you a crystal clear picture of what is happening in and around your home.

Keep on top of your home's energy usage! As the seasons change, do another audit, even if it is a quick, cursory one. See what has changed around your home.

And remember...the energy audit, when done correctly, is always 100% effective in finding where your energy holes might be. Once you know where the problems might be, you can develop a plan to correct them.

Then, your task is so much easier.



Acknowledgments

This guide was born from an idea first hatched in 2003, before energy costs really began to skyrocket. In fact, the first energy audit guide was buried in a book of more than 400 pages and relegated to an appendix.

I simply can not stress enough the importance of an energy audit. The idea of taking any energy saving tip, however good it may sound, and applying it to a home once seemed right to me, a sure win. Now, I think of that practice as prescribing a drug that cures some disease even though the doctor has no idea what disease he's curing or even looking for.

I want to acknowledge the US Department of Energy for pointing me in the right direction, the previous owners of this house for giving me the inspiration to want to save money on energy (because of their shoddy, short cut approach to home improvement and construction), the utility company for constantly rising their rates, and Home Depot, for being so close to my house and being open on Saturday nights.

Thanks also goes out to my wife, who gives me all the support I need and my entire family, for complaining enough about how warm / cold it is.

And of course, thanks to you, the reader, who is interested in saving money on energy bills as well. Without you, there would be no reason to share this information.