E3A: User's Guide Assessment and Fact Sheets

Authors: Sarah Hamlen; Mike Vogel and Milton Geiger eds. E3A Program

User's Guide

Needs Assessment

Your success in implementing effective energy education will hinge upon your ability to identify local needs and adapt educational materials to meet those needs.

Developing a needs assessment involves answering the following questions:

- **Who should be assessed? Who is the programming attempting to inform, influence, or persuade?**
  Be specific in identifying the audience you wish to assess and ultimately impact. Programming efforts may draw "the general public," but you should know your target audience. If you are attempting to address multiple segments in the community (agricultural producers, homeowners, business owners, etc.) be aware of developing differing programming strategies for each and asking different questions in the assessment process to establish their needs.
- **What do you need to know? What questions need to be asked? Can you change the situation?**
  Before designing an assessment tool, determine what you need to know in order to plan programming. As an example, you might want to know the motivation behind your audience's interest in energy – are they worried about rising energy prices? Are they concerned about environmental issues? Are they curious about educational projects that might be done in the community? Understanding the underlying interests in energy will aid in tailoring programming efforts. Use the E3A Map in this guide and the Importance Scale Survey to help!
- **How do members of your target audience prefer to learn about energy?**
  Program planning should consider the venue of educational efforts. Would your audience prefer to attend a class? View a webinar from home? Listen to a pod cast? Have a one-on-one discussion about their needs? Understand audience preferences as you design your programmatic plan.
- **When would your audience prefer to learn about energy?**
  Take some time to learn about audience preferences (seasonality, time of day, time of week, etc.).

Five Needs Assessment Techniques

Existing Information Approach

This approach uses existing information to obtain insights about the target audience. To gain a better understanding about your target audience needs in energy, consider the following:

- Contact the local utility. What is the average kilowatt-hour consumption per month or year per household/agricultural operator in your area? Are you higher or lower than the state average? What is the price of electricity, natural gas, or propane in your area? How does it compare to other areas? Are any significant changes in price expected? Is the utility doing educational workshops or outreach?
- In housing, talk to your local housing authority, Human Resource Development Council (HRDC), or utility. What are the weatherization and energy efficiency needs in your area? Are there unique needs in your community?

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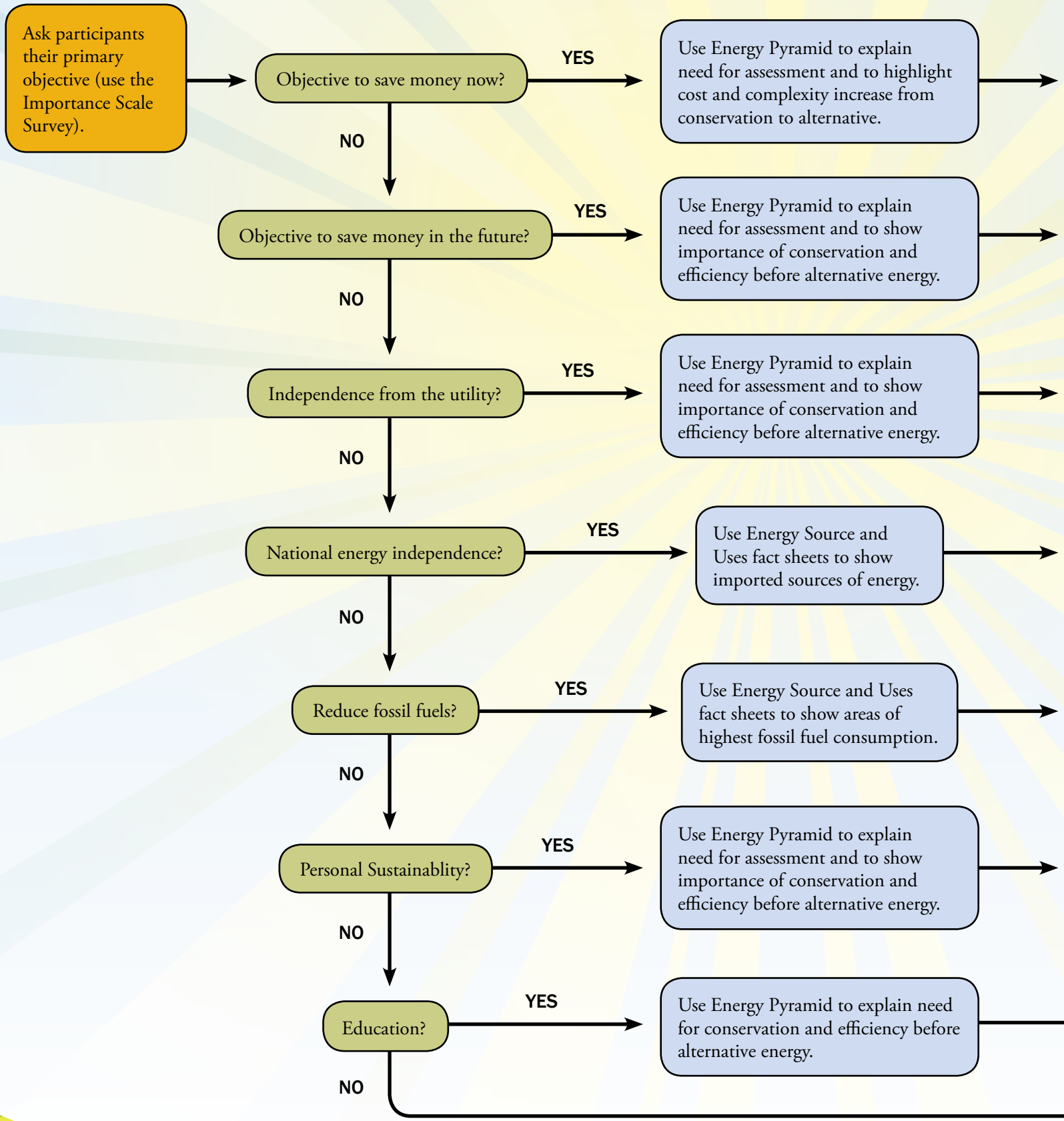
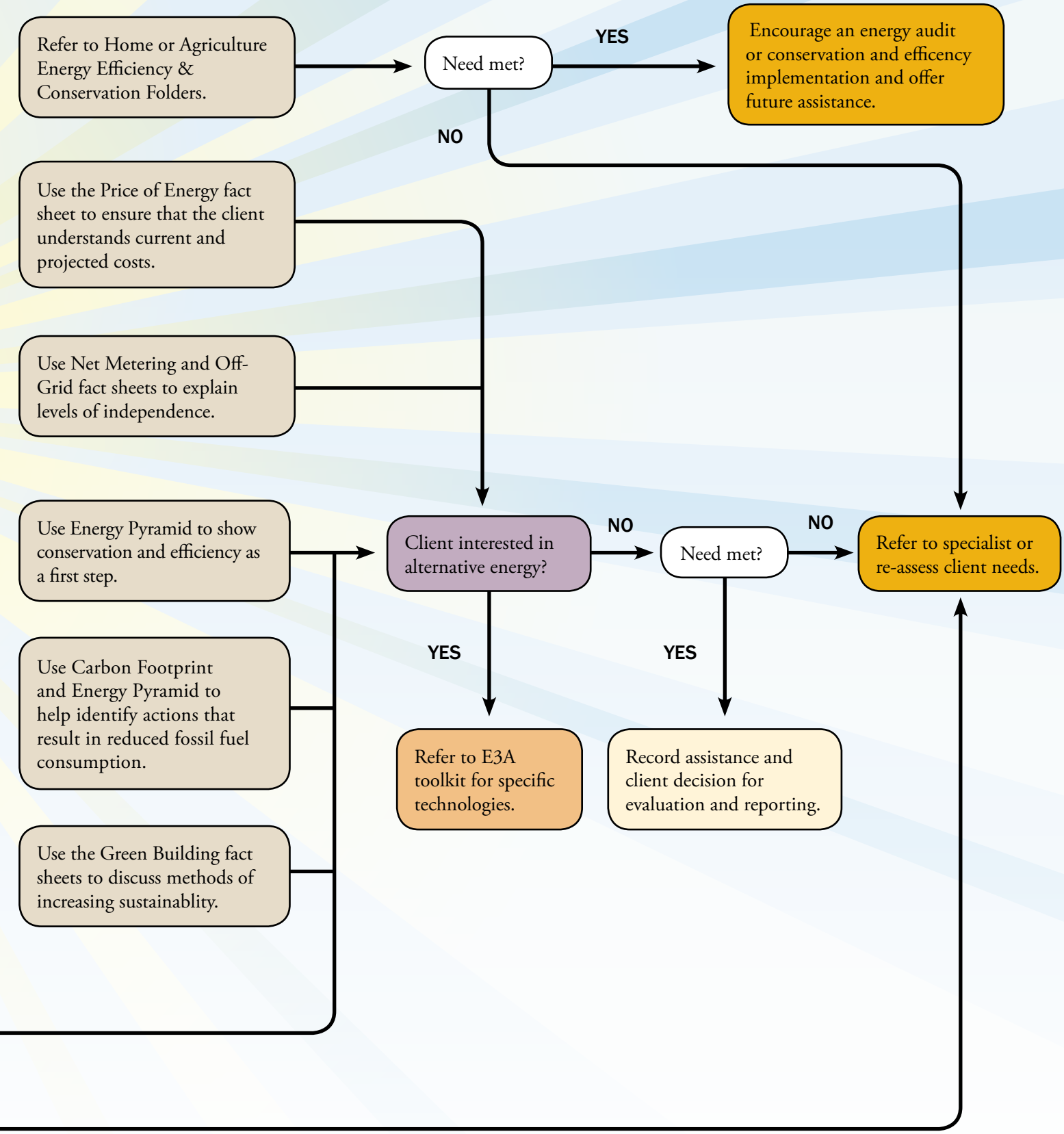


oring Energy Objectives



- In agriculture, talk to the local irrigation distributor/ installer. What needs exist in irrigation energy management? Talk to the local utility – what needs are they finding? What programs do they have that are underutilized?
- Call the Montana Weatherization Training Center (or equivalent in your state) or Extension Specialist. What do they know about energy needs in your area?

1. Attitude Survey Approach

Attitude assessment in energy education is important in designing programming strategy. In order for a consumer to make an appropriate energy decision, they first need to determine what it is they seek to accomplish. Consumers often express a desire to invest in alternative energy because:

- Alternative or renewable energy is a topic in media and in public policy debate. Sometimes, the assumption is made, "I have an energy concern. Alternative energy is a hot topic. Therefore alternative energy will address my concern." This is not always accurate and may actually prove detrimental to alterative energy in the long term, as people who make inaccurate assumptions about the capabilities or effectiveness of alternative energy to resolve their specific issue may ultimately be dissatisfied with system ownership.
- Some energy prices are rising. Consumers are especially aware of rising prices for petroleum-based products. As pump prices increase, the desire of consumers to make changes in energy consumption also increases. However, what is happening at the pump (petroleum), may not be related to prices of other forms of energy (electricity). The more consumers can understand their concerns and the actions they take to resolve those concerns, the more likely they are to be satisfied with their results.

As educators, our role is to help consumers make informed decisions using unbiased, research-based information. Part of the informing process is helping consumers to understand what problem they are attempting to solve and then finding a course of action that will resolve their problem.

Methods of Assessing Attitudes

Attitudes can be assessed prior to an educational event, or as part of a workshop. In a workshop, here are some methods for establishing the attitudes in learning energy from your clientele:

- Importance Scale Survey: Ask constituents to complete an Importance Scale Survey worksheet. In a larger group, you can have them report to the group or discuss their key objectives in smaller groups. In a small group, you can review the worksheets. You can also collect them for tabulation later. Have the related map handouts on hand to address the needs.
- Personal Interview: In non-formal small groups or one-on-one teaching environments, discussing the attitudes of the constituent can help you to assess the types of information you may need to present. You may ask why they have interest in energy or what they are trying to accomplish.
- Sticky Wall: For groups of 10 to 20, you may consider using a sticky wall. Make labels of each "reason" listed on the Importance Scale Survey on a large card and stick it to a wall. Provide each participant with a large note card and a survey. Ask them to take five minutes to read the survey and write down their top/primary objective for making changes in their energy use. Ask the participants to place their card under the heading that BEST describes their objective. (If people have more than one objective, ask them to pick their top priority.) Sticky walls can be created on a sheet using spray adhesive, or you can tape cards directly to the wall.
- Facilitated Discussion: Ask participants why identifying attitudes or objectives is important? As an example, "What considerations might be more or less important to you if your objectives are associated with environmental concerns than with financial concerns?"
- TurningPoint Clicker Voting: In larger groups or if you feel your constituents will not want to share their reasons, TurningPoint clicker voting can be a great way of soliciting information without putting people on the spot.

2. Key Informant Approach

The Key Informant Approach identifies community leaders who are knowledgeable about the community and can accurately identify needs and concerns. Key informants can complete a questionnaire or interview to obtain their impressions of community needs. The information is then analyzed and programming strategy is determined.

3. Community Forum

A public meeting is held where the participants discuss some of the energy needs facing the community, what some of the priority needs are, and what can be done about these needs. All members of the community are encouraged to attend and express their concerns.

4. Focus Group Interview

A group of people selected for their particular skills, experience, views, or position are asked a series of questions about a topic or issue to gather their opinions. Group interaction is used to obtain detailed information about a particular issue. Use the Montana State University Extension MontGuide "Using Focus Groups for Community Development," (publication number MT200807HR) to implement this form of needs assessment.

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Notes

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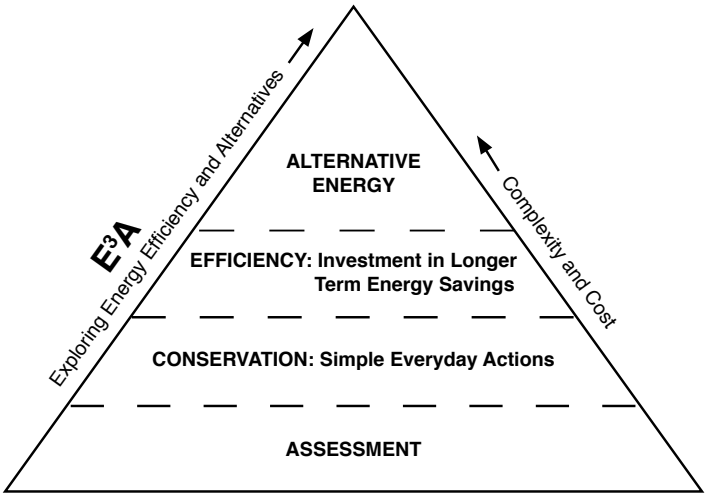
User's Guide

The E3A Pyramid

The E3A toolkit uses the Energy Action Pyramid for Home, Farm and Ranch to help you make informed energy decisions.



Assessment

The foundation of the pyramid is assessment. Assessment is an essential element, not only at the beginning of an energy decision process, but throughout the process. Assessment helps to ensure that any actions taken are an appropriate solution to a problem. The E3A series recommends two types of assessment:

- **The Importance Scale Survey** – While it is easy to get excited about wind turbines or photovoltaic panels, you should first understand why you are interested. You may have heard the quote by Yogi Berra, "You've got to be very careful if you don't know where you're going, because you might not get there." The same holds true for energy – knowing your objectives and planning your actions will result in a more informed, successful investment.
- **Energy Audit** – To optimize the effect of actions you take toward your objectives, you should complete an energy audit. Energy audits help you to understand your energy consumption, efficiency, and opportunities for change – they also provide indications of cost of those changes. Energy audits can be completed through self-assessment checklists or with a formal energy audit. Audits help you to understand your situation more completely and to set appropriate priorities.

Cost and Complexity

The pyramid shows that cost and complexity of energy actions typically increase as you move from energy conservation activities, to energy efficiency measures, and finally to alternative energy projects.

Conservation and Efficiency

Conservation and efficiency measures have numerous benefits by themselves, but are especially important when considering an alternative energy system. Why? The size of an alternative energy system is based on your current energy consumption. Take steps to conserve and use energy resources more efficiently and you will likely be able to install a smaller system that costs less to purchase and operate.

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Conservation

Conservation entails simple, everyday actions. Find information that is more detailed in the Home and Ag Energy Efficiency folders of E3A. However, some quick examples include:

- **Hot Water:** Set your water heater at or below the recommended 120°F. Use the cold setting on your washing machine.
- **Electricity:** Maximize pumping efficiency on existing irrigation systems. Turn off lights, electronics, and other devices when not being used.
- **Space Heating and Cooling:** Adjust your thermostat to reduce energy use when you leave a building for more than several hours. In summer, shade east, west, and south-facing windows to reduce unwanted solar heat gain. In winter, allow solar heat gain.
- **Fuel Consumption:** On-farm, operate tractors and other powered equipment at optimum efficiency and shade fuel tanks to reduce vapor loss. At home, consider car-pooling and check for proper tire inflation. Take actions to reduce the number of miles traveled.

Efficiency

Efficiency measures entail the use of a material or technology to reduce energy use. Examples might include:

- **Hot Water:** Install WaterSense-labeled showerheads and fixtures. Insulate hot water pipes and water heaters.
- **Electricity:** Use variable speed drives on irrigation systems. Use surge protectors or power strips to completely turn off electrical devices that use stand-by power (they use electricity even when turned off). Install Energy Star-labeled appliances, machinery and equipment where available.
- **Space Heating and Cooling:** Check your building's insulation levels and add more if needed. Have a blower door test conducted to find air leaks from doors, windows, electrical outlets, etc. Install programmable thermostats to adjust energy use automatically. Plant deciduous trees/plants that block summer sun from entering windows. They allow solar heat gain when they drop their leaves in winter.
- **Transportation:** Consider the purchase of a more fuel-efficient tractor or vehicle.

Alternative Energy

Consider alternative energy after completing conservation and efficiency measures. There are many factors to consider before purchasing and installing an alternative energy system. The materials in the E3A toolkit are designed to help you understand these factors so that you can be a more informed consumer. However, you should work with a qualified installer to design, site, and install alternative energy systems.

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Net Metering Electrical Energy Generators

Nearly all households pay utility companies monthly for electricity service. As national energy consumption and issues of energy independence are increasingly being discussed, many are considering methods for reducing monthly bills by generating energy themselves. This is typically accomplished by installing a renewable energy generation system, such as a small wind or solar system, but may include a host of other technologies as well.

Interconnecting a renewable energy generator, while remaining connected to the local electrical utility, and receiving incremental credit for energy produced is referred to as net metering. Many states have enacted legislation to encourage net metering. Check the laws and utility programs to understand how net metering is applied in your state.

Net metering involves installing a special electric meter or reprogramming an existing meter so that electrical flow can be measured in both directions. Traditional electric meters only measure electricity flowing from the utility company to the customer. Because net metering customers are generating electricity in addition to using electricity, the meter must be able to measure the flow of electricity both from the consumer and the utility company. Depending on the type of meter currently installed, this may involve the utility company reprogramming the existing meter, or installing a new meter. Some utilities will provide this meter at no cost as part of the interconnection process, while others will pass the cost of this new meter on to the customer. Utilities typically encourage those considering net metering to contact them early in the process to identify meter considerations and to ensure that any wiring is done according to utility company specifications.

A net metering customer's production and use of electricity will not be equal most of the time. When their production of electricity is less than their use, additional electricity is supplied by the utility company through the electrical grid. Alternatively, when a customer generates more electricity than they are using, excess electricity is transferred to the electrical grid and is used by other customers. At the end of the billing period, the net metering customer's electrical production is subtracted from their total electrical consumption. The customer is billed only for the net amount (this is why the arrangement is referred to as net metering) of electricity consumed. In some situations a customer may produce more electricity than they use, in which case the excess amount may be carried over to the next billing period or transferred to the utility company at a price (often zero) determined in the net metering contract.

The contract provided by the utility company determines how often the account is "trued-up." The true-up period is the point in time when the difference between production and consumption of electricity is computed. True-up periods are typically either monthly or annual, depending on the utility. Arrangements with the utility company will also determine the price of any electricity purchased from the utility company and the price at which any excess power will be purchased by the utility company.

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Advantages

Net metering offers several potential benefits. Net metering projects may provide a positive financial return for system owners. In these cases, the value of the reduction in monthly electric bills is larger than the cost of installing and maintaining the system. Some customers value knowing that some of the electricity they are using is provided by a renewable, local, or an alternative generating resource. Other customers value being somewhat self-sufficient in their electrical usage.

Concerns

Opponents of net metering often cite these issues. First, net metering has potential to reduce revenue for utility companies. Customers who reduce their electrical bills also reduce their payments to the utility companies that help pay for fixed costs. Some utilities, especially smaller utilities with large service areas, express concerns that the loss of revenue from net metered customers does not reduce the cost of operation or service to those customers. To date, this has not been a significant issue due to the limited number of net metering customers. Second, some opponents question the return on investment for net metering systems. Most renewable energy generation systems require many years to provide a positive financial return. While some look at non-monetary values in renewable energy generation, those who look to the current return on investment as a measure of the project's value may argue that there are other means of making changes to energy use that have faster payback.

What is the Difference Between a Kilowatt (kW) and a Kilowatt hour (kWh)?

In simple terms a "watt" is a measure of power, while a "watt-hour" is a measure of energy. Every 1,000 watts equals one kilowatt. Most electrical appliances consume energy in watts, which are a measure of energy conversion. A light bulb with a power rating of 60 watts will use the energy of 60 watt-hours if it is turned on for one hour. In the case of renewable energy generators, the power generator is measured in terms of its power, or kilowatts, but its actual generation is measured in kilowatt-hours. A kilowatt-hour is the amount of energy equivalent to a steady power of 1 kilowatt running for one hour. The electrical meter, which is also called a kilowatt-hour meter, tracks electrical consumption and customers are billed each month by the utility for the number of kilowatt-hours used during that billing period. According to the U.S. Department of Energy, the average Montana household consumed 843 kilowatt hours per month, or 10,116 kilowatt-hours in 2008.

Is net metering right for me?

A customer should ask themselves several questions when considering a net metering project, such as:

- *Will zoning regulations for my area allow for the installation of a generation system, such as a wind turbine or solar panel?* It is fairly common for cities and sub-divisions to limit the height of structures and types of structures in their jurisdiction. If zoning laws prohibit wind towers or solar arrays you may not be a good candidate for a net metering project.
- *What systems will my utility allow and what standards must be met by the system?* Net metering policies will vary by utility. Contact your local utility early in the process of considering a net metering project to obtain copies of their policy.
- *What is my current cost (per kWh) of electricity? What energy price increases can be anticipated?* Net metering projects will have a better financial return in situations with higher per kWh prices or when energy prices are expected to rapidly escalate. In many areas of the United States, current projections assume an annual three to four percent increase in energy prices in the near term.
- *How much energy per meter do I currently consume?* Net metering establishes an energy offset on a meter-by-meter basis. When calculating energy consumption, customers should only consider the meter they intend to off-set with alternative generation. Determining total energy consumption per meter can be accomplished by contacting the utility or reviewing your past statements.
- *What will a net metering system cost?* Before estimating the cost of a renewable energy system use the E^{3}A fact sheets to better understand your specific need. This will help you more accurately estimate the cost your potential project.
- *Do I have an appropriate generation resource?* For example, some locations have better wind and/or solar resources than other locations. The better the resource, the more power the system will generate.

Incentives

Governments, utility companies and non-profit organizations offer a variety of programs to support alternative energy development. These incentives may include tax credits based on capital costs or electrical production. Other incentives may be in the form of a grant or other direct payment. Free or reduced-cost technical or business planning advice may also be available. The requirements to qualify for these incentives vary depending on the specifics of each program.

Economics

The key economic issues for net metering are:

- The amount of energy being consumed per meter.

- The cost of electricity supplied by the utility and anticipated cost increases.
- The cost of the alternative generation system, less any grant or tax incentives.
- The amount of energy projected to be produced by the alternative generating system.

The revenue (reduced electrical charges) generated by a net metering project is determined by the amount of electricity produced and the rate at which it offsets electricity that otherwise would have been purchased at retail price from the utility company. In Montana the statewide average retail price for electricity in 2009 was 8.94 cents per kWh. This was below the national average of 11.55 cents. The financial performance of net metering projects improves as electricity rates increase. Additional revenue may also be available in the form of grants or tax credits. Renewable energy projects may also receive some revenue from the sale of renewable energy or carbon credits.

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User's Guide

Off-Grid Living

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Living "off-grid" refers to living in a self-sustaining manner without reliance on one or more utilities. Some consider disconnecting from the electrical utility to be off-grid, while others take a more intense view and consider a truly off-grid application to be one that is disconnected from all public services (electricity, city sewer, water, waste disposal and even mail). For purposes of E3A, off-grid is concerned only with disconnecting from the electrical utility.

There are many reasons why people do not connect to the utility grid. For agricultural producers, off-grid applications are common for remote stock water facilities that are distanced from available electrical supply. Homeowners may also opt to be off-grid because the distance (and cost) of running electrical service to the home is prohibitive. Some homeowners pursue being off-grid out of concern for the environment and a desire to reduce dependence on fossil fuel-based sources of energy. Others like the idea of being more self-sufficient and being rid of monthly utility bills. No matter your motivation for considering off-grid living, there are a few facts about being off-grid that may help to determine whether it is right for you.

1. System Design

Design of an off-grid system can be complicated. In addition to considering one or more sources of electrical generation, you must also consider the use (load), storage, voltage, and quality of the electricity. In off-grid agricultural applications (such as stock water facilities) these considerations are not overly complicated. However, in a home, there are many system design considerations, including determining how to heat your living space and water. There are qualified off-grid system designers who can assist you in these decisions, but at present, finding a qualified designer may pose a major challenge. If you intend to design your own off-grid system, consider attending classes, such as those offered by Solar Energy International, to learn more about appropriate system design.

Space heating can be provided by propane, but can also be accomplished through building design and using solar thermal technologies. A building can generate natural heat and cooling using passive solar design principles. In passive solar design, the building has a northwest axis. In the northern hemisphere, the sun's lower-angled, direct winter rays enter the south-facing wall's windows. Thermal mass materials (typically masonry flooring) absorb the energy and radiate it back into the space as heat. Roof overhangs and awnings block the sun's higher-angled, direct summer rays keeping the building cooler. Passive

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solar design buildings have high levels of insulation to help retain the conditioned air. This strategy is called "passive" solar because these design elements entail no moving parts. Passive solar buildings can include "active" elements such as fans for air distribution and heat recovery ventilators, etc. For existing buildings, solar air collectors can be used to generate heated air. They can be retrofitted into a wall or roof. They use the sun's energy to heat individual rooms and supplement existing HVAC systems, or to pre-heat ventilation air (transpired solar collectors).

Off-grid-buildings can use propane or solar thermal technology to heat water. For more information on solar hot water systems, refer to the E3A Solar Hot Water folder. Be aware, however, that solar hot water systems typically used in colder climates do require electricity for controls and to pump liquids through the collectors.

2. Investment in Renewable Energy Technologies

Off-grid applications can utilize many modern conveniences, but still require at least one source of power. While petroleum-fueled generators can be used, it is more typical (and usually more cost effective) for off-grid applications to use renewable energy technologies. Solar and wind applications are commonly found in off-grid applications.

3. Batteries and Balance-of-System Equipment

Safe utilization of the electrical current generated in an off-grid application requires additional equipment to condition and transmit the electricity. This additional equipment can account for up to half of your total system cost (U.S. DOE, 2011). The amount of equipment and expense will vary according to your system design, but typical components of an off-grid system (especially in a home) include:

- **Batteries** — When your renewable energy system is not producing energy (or is producing at low levels), you will need to rely upon stored energy for your needs. Batteries store the energy produced by renewable energy sources and the back-up generator. In off-grid applications, "deep cycle" batteries (generally lead-acid) are typically preferred. Deep cycle batteries can repeatedly charge and discharge up to 80 percent of their capacity without significant wear on the battery. Shallow charge batteries (like automotive) can only be drawn down by about 20 percent, and are not recommended. Deep-charge batteries can be expensive, but the amount of expense depends both on the amount of load (demand) the system will place on the battery and the amount of storage required. For example, some homeowners are comfortable with storing one to three days of electricity demand. Others may feel that they need to store more energy. For example, a homeowner with a wind and solar-based system in Montana or Wyoming may consider weather patterns – are there multiple days in the winter when temperatures are well below zero, the wind is not blowing and it is cloudy?

  Homeowners also need to consider battery space and location. For health and safety reasons, batteries need to be stored in an area that accessible and well ventilated but isolated from living areas. New home construction can plan for a battery storage area. Existing structures may require retrofitting to accommodate batteries.
- **Charge Controllers** — Charge control devices regulate the flow of electricity between the renewable energy generation source and the battery. The charge controller senses the demand for electricity and the charge of the batteries. When batteries are fully charged and there is no further need for electricity in the home, the controller will either stop the flow of electricity to the batteries, or will divert it into a "shunt" or "dump" load. In home applications, the dump load may be an electric water heater. Some rural residences use the dump load to heat livestock water tanks in winter months. When batteries are low, the controller will stop the electricity flow to the home until the batteries reach a certain level of charge. This feature extends the life of the batteries. Cost of charge controllers vary by the amount of load on the system and the features you select.
- **Inverters: Power Conditioning Equipment** — Most renewable energy technologies generate direct current (DC) electricity. However, most electrical appliances in the United States run on 60 hertz alternating current (AC) electricity. Some off-grid applications use DC equipment or appliances, but especially in a home application, it is more typical for AC current to be used. Inverters serve these primary purposes:
  - Conversion of constant DC power to oscillating AC power
  - An Inverter/Charger converts DC to AC, but also converts a back-up generator's AC into DC for charging batteries
  - Regulates the frequency of the AC cycles to 60 cycles per second
  - Manages voltage consistency (extent to which the output voltage fluctuates)
  - Regulates the quality of the AC sine curve (whether the shape of the AC wave is jagged or smooth)
  - Power quality is especially important if you intend to operate sensitive electronic equipment such as computers and high-definition televisions, which cannot withstand much power distortion.

  Inverters range in cost based on the quality of the power you intend to use, as well as the features that you include in your power-conditioning package. The conditioning equipment you require is dependent on many factors and needs to match the voltage, phase, frequency and sine wave profiles of your generation source. A qualified off-grid system designer can help you to determine your needs.
- **Safety Equipment** — You will need to ensure that your system has safety features installed. Three common safety elements are safety disconnects (which either

disconnect the system in a generation malfunction, or can be disconnected when you are performing system maintenance), grounding equipment, and surge protectors.

- **Meters and Instrumentation** — Meters and monitoring equipment enable you to track your generation system output, as well as battery charge and your consumption. Costs will vary based on the level of monitoring you desire.

4. Cost and Finance of the System

A key benefit of being off-grid for many consumers is getting rid of utility bills. However, as you consider living off-grid, do not forget that you may have up-front costs associated with installing your system. Upfront costs of off-grid systems tend to be higher than grid-connected renewable energy systems, especially as the additional system components add to the expense. You should also remember that you will have annual operation and maintenance expenses associated with your system. As part of your research process when considering living off-grid, be sure you consider how you will finance your system and what terms are available to you. Also, talk to your home mortgage lender. Some conventional lenders either do not offer loans or require additional appraisal requirements for off-grid homes.

Back-up Generation and Hybrid Systems

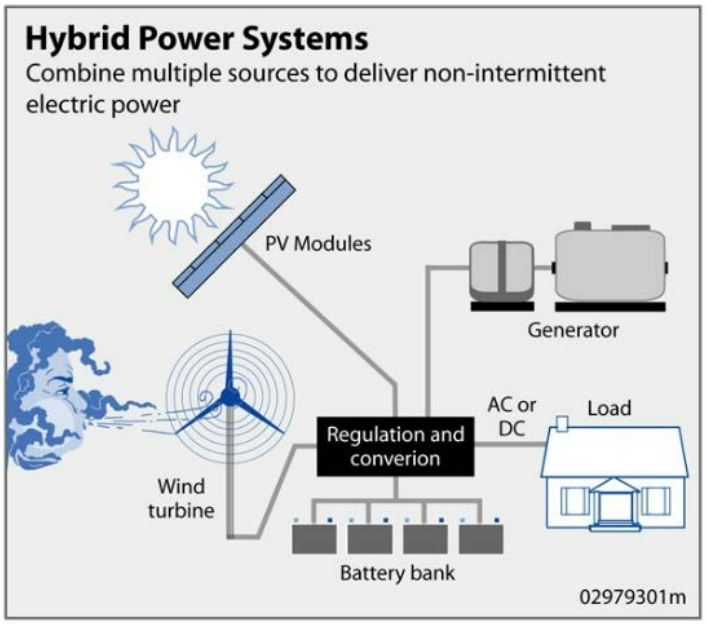
In order to maintain a certain level of battery charge and ensure constant availability of electricity, you will need a back-up generation source and/or a hybrid system. Hybrid systems utilize more than one renewable energy system (usually wind and solar) to provide more consistent electrical generation. As an example of how this pairing of systems works, when it is cloudy and stormy and the solar system output is less, the wind is likely to be blowing.

While hybrid systems can provide more consistent power, off-grid homeowners often have back-up generators in place as well. Generators are used to recharge batteries and supply electricity to the home if the renewable energy systems are not operational, or if load demands draw the batteries down to the point where additional generation is needed to recover a level of charge.

5. Conservation as a Lifestyle in an Off-Grid Home

All off-grid systems need to consider conservation and storage of electricity. Unless you invest in a system that can accommodate every convenience, living off-grid magnifies those considerations. Here are a couple of examples:

- Decisions about what electricity to use may depend upon the amount of electricity available. Using a hair dryer while running the automatic coffee pot and microwaving something for breakfast may be too much load for your system at one time.
- You will need to continually monitor your system. Some monitoring, such as checking the charge of the batteries and ensuring that the system is generating electrical current, is done almost daily. Other monitoring, like water level of the batteries, can be done less frequently.
- You may need to invest in a propane-fueled refrigerator and propane-fueled electrical clothes dryer (or decide to forego a dryer and other appliances). Large electrical loads are not desirable in an off-grid home because of the amount of electricity required to support their operation.



Source: U.S. Department of Energy
http://energy.gov/energysaver/articles/hybrid-wind-and-solar-electric-systems

Off-grid living is possible, but requires an increased awareness of energy consumption. System design is especially important. Do-it-yourselfers may welcome the challenge of researching and undergoing training to design an optimized system, but be aware that these are complex systems (if you intend to have modern conveniences) and selecting a qualified system designer may be your best option.

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E3A: User's Guide Assessment and Fact Sheets

Authors: Sarah Hamlen; Mike Vogel and Milton Geiger eds. E3A Program

User's Guide

Green Building Programs for High Performance & Energy Efficiency

When people look to buy or retrofit a home or other building, they consider purchase price (the first price tag), number of rooms, the floorplan, and the overall "look." An increasing number of buyers are also considering the "second price tag" that addresses the operation and maintenance of a building. They are asking questions about energy and water bills, maintenance and durability, indoor air quality, and comfort. In other words, how will the building perform?

If you see the value of both price tags and want to build or buy a better home or building that is "above code," review the programs listed. Their guidelines take an integrated, whole-systems approach and address the energy and natural resources required to build, operate, and maintain buildings. They recognize the impact buildings have on the environment and the pocketbook.

The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Program

The LEED Program (www.usgbc.org/LEED) promotes green building design, construction, operations and maintenance strategies for homes, institutions, and commercial and industrial buildings. It also promotes sustainable building interiors and neighborhoods. The program considers performance in the following categories: Site Selection; Water Efficiency; Materials & Resources; Energy & Atmosphere; Indoor Environmental Quality; Location & Linkages; Awareness & Education; and Innovation. Points are earned in each category leading to four possible levels of certification.

Homes

- **Existing Homes:** LEED currently does not address existing homes.
- **New Homes:** LEED for Homes houses maximize fresh air, minimize airborne toxins and pollutants, and have the potential to use 20-30 percent less energy (some up to 60 percent less) than a home built to the International Energy Code Council's (IECC) 2006 code. http://greenhomeguide.com/program/leed-for-homes

Farm and Ranch Buildings

- **Existing Buildings:** The LEED for *Existing Buildings: Operation and Maintenance* program helps building owners/operators measure operations, improvements, and maintenance, to maximize operational efficiency and minimize environmental impacts. It addresses whole-building cleaning and maintenance issues (including chemical use), recycling programs, exterior maintenance programs, and systems upgrades.
- **New Buildings:** the *New Construction and Major Renovations* program is primarily for office buildings, but its strategies have been applied to many other building types.

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The National Association of Home Builders (NAHB) National Green Building Standard

NAHB's National Green Building Standard (www.nahbgreen.org) is for single and multifamily homes, home remodels, and site development projects. The program considers performance in the following categories: Lot Design, Preparation and Development; Resource Efficiency; Energy Efficiency; Water Efficiency; Indoor Environmental Quality; and Operation, Maintenance, and Owner Education. Points are earned for four possible certification levels.

Earth Advantage Institute

The Earth Advantage Institute's program (www.earthadvantage.org) includes new and existing homes and is currently developing a program for commercial buildings. Program categories: Energy, Water, Health, Land, and Materials.

Environments for Living

The Environments for Living Certified Green program (www.environmentsforliving.com) addresses Energy Efficiency, Durability, Indoor Air Quality and Water Efficiency for three possible certification levels.

U.S. Environmental Protection Agency's (EPA) Energy Star Program

The EPA's Energy Star Program (www.energystar.gov) is an energy efficiency based program for new and existing homes and commercial/industrial buildings.

www.energystar.gov/

Homes

- **Existing Homes:** Provides information on how you or a contractor can improve your home's energy efficiency. Addresses how to conduct an assessment, sealing and insulating, and how to heat and cool efficiently.
- **New Homes:** Provides guidelines for building a home that will be 15 percent more energy efficient than a home built to the 2004 International Residential Code (IRC), and 20-30 percent more energy efficient than a standard home. Addresses efficient insulation, high-performance windows, tight construction and ductwork, efficient heating and cooling equipment, and Energy Star-qualified lighting and appliances.

Farm and Ranch Buildings

- **Existing Buildings:** The "Building and Plants" section provides a link to a "Building Upgrade Manual" (http://www.energystar.gov/ia/business/EPA_BUM_Full.pdf) that provides tips on lighting, supply load reduction, air distribution, and heating and cooling equipment upgrades.
- **New Buildings:** provides information on how to make informed decisions about energy efficiency during the design process.

The Passive House Institute, U.S. (PHIUS)

PHIUS (www.passivehouse.us) has developed one of the highest building energy standards that can be applied to new construction and retrofits of homes, institutions, and commercial buildings. The standard saves up to 90 percent of space heating costs. A PHIUS-certified building is very well-insulated, virtually air-tight, and primarily heated by passive solar gain and internal heat gain from people, appliances, equipment, etc. Energy losses are minimized through air-tight construction and few if any thermal bridges. Any remaining heat demand is provided by an extremely small source. Summer heat gain is avoided through shading and window orientation eliminating or reducing the need for air conditioning. A heat or energy recovery ventilator provides a constant and balanced fresh air supply.

Every program listed entails either a point-based rating system and/or computer verification tool. Neutral, third-party certification (on-site inspections and testing, etc.) is required to ensure quality and high performance.

State and Local Programs

The listed programs may have state or local chapters with websites that provide contact information of trained and certified individuals and companies that can help design, build, remodel, and certify your high-performance building.

- Northwest Energy Star: www.northwestenergystar.com/
- USGBC Montana Chapter: www.usgbcmontana.org/
- USGBC Wyoming Chapter: www.usgbcwyoming.org/
- Montana Building Industry Association's (NAHB) Green Building Program: www.montanabia.com

Renewable Energy Design Strategies

Most of the listed programs provide certification points for renewable energy design strategies and considerations:

- Passive Solar Design: www.nrel.gov/docs/fy01osti/27954.pdf
- Solar Ready Design: www.nrel.gov/docs/fy10osti/46078.pdf
- Net Zero Energy Buildings: www.nrel.gov/sustainable_nrel/pdfs/44586.pdf; http://zeb.buildinggreen.com/

Incentives

- An Energy Efficient Mortgage (EEM) credits a home's energy efficiency in the mortgage itself. www.energystar.gov/index.cfm?c=mortgages.energy_efficient_mortgages
- The DSIRE website (www.dsireusa.org) provides up-to-date information on utility and government incentives available for energy efficiency projects.

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User's Guide

Understanding Your Energy Consumption and Expenses

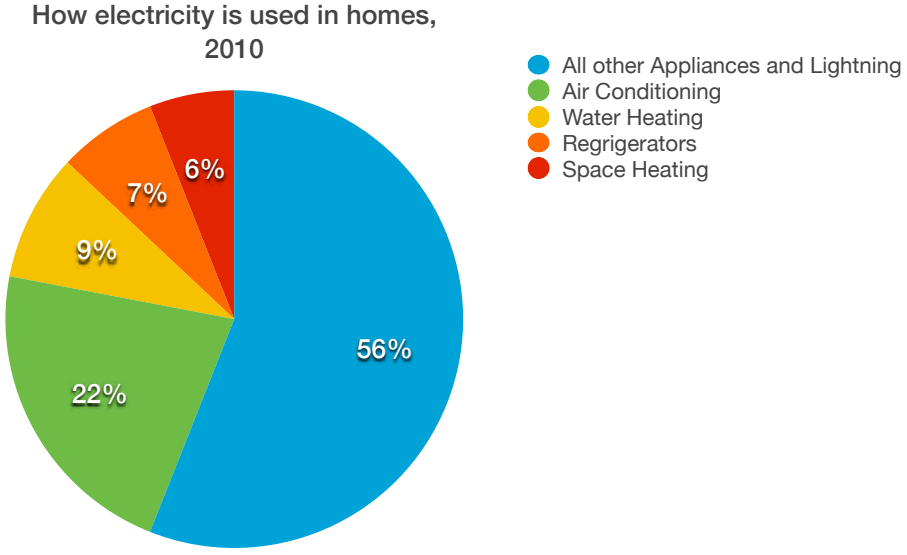
Understanding your current energy consumption and your current cost of energy is part of making an informed energy decision. This worksheet will help you explore the types of energy you currently use and the current price you pay.

Electricity

Electricity in the home is primarily used to power lights and appliances (56 percent), condition air (22 percent), and heat water (9 percent). Roughly 39 percent of total United States electricity consumption in 2009 was residential. Demand for electricity has grown over the long-term, however, the growth has slowed progressively each decade since the 1950's. In the 1950's, demand increased by 9 percent per year, compared to the 1990's, where demand increased by 2.5 percent per year. From 2000 to 2009, increases in electricity demand averaged 0.5 percent per year. Demand growth is projected to be approximately 1 percent per year through 2035. (EIA DOE, 2011).

In agriculture, electricity is used for irrigation pumps, indoor and outdoor lighting, grain drying, powering farm shops, and livestock water systems. Average consumption in agriculture is difficult to determine because of the many and varied types of agricultural operations. If trying to determine total consumption and price of electricity, agricultural operators need to pay attention to whether demand charges have been assessed when reviewing statements.

Electricity Cost	United States	Mountain West	Montana	Wyoming



Source: U.S. Energy Information Administration. Annual Energy Outlook 2011. Table 4. Reference Case. Projections based on the Residential Energy Consumption Survey 2005.

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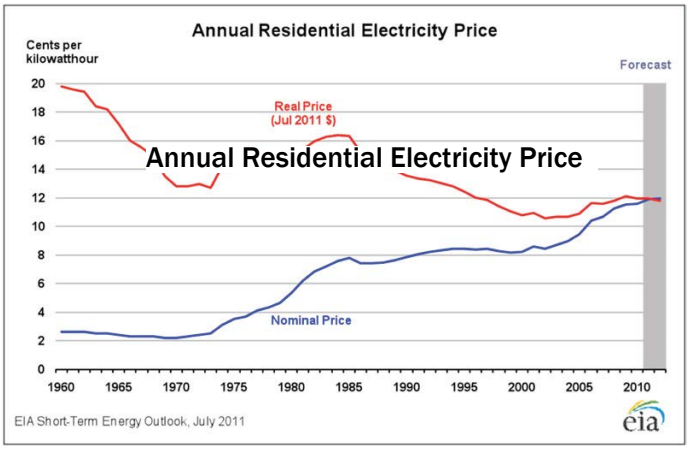
Cost in Cents per kWh (February 2010)	10.95	9.79	8.61	8.26
Cost in Cents per kWh (February 2011)	11.2	9.76	9.33	8.5

Electricity Residential Consumption	United States	Mountain West	Montana	Wyoming
2009 Average Monthly kWh	908	878	856	887
2009 Average Monthly Bill	$104.52	$89.38	$76.48	$76.12

The U.S. Department of Energy's Energy Information Administration 2011 Short Term Energy Outlook provides some historical context for understanding electricity prices by comparing the nominal to real prices over time. Nominal prices are the actual price paid in a given year. Nominal prices are adjusted to account for inflation to generate real prices (in current dollars). Real prices are generally a more useful way of evaluating prices.



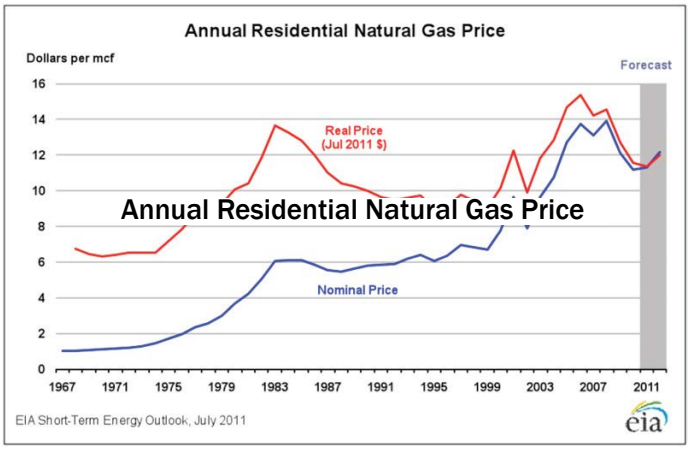
My Electricity Data

Use the following table to record information about your electricity.

Electricity Data	
My electrical utility is…	
My total kilowatt hours per year are…	
My average kilowatt hours per month are…	
My cost in cents per kWh is…	

Natural Gas

Natural gas is most commonly used for heating. More than half of single-family homes in the United States use natural gas as the primary heating source. Because natural gas is typically delivered through a pipeline, it is not commonly used in agricultural operations. The price of natural gas paid at the residential level will vary based on the supplier, type of contract, delivery costs and other factors. However, the EIA data shows that, while price of natural gas has declined in the past several years, the real price has trended upward over time.



My Natural Gas Data

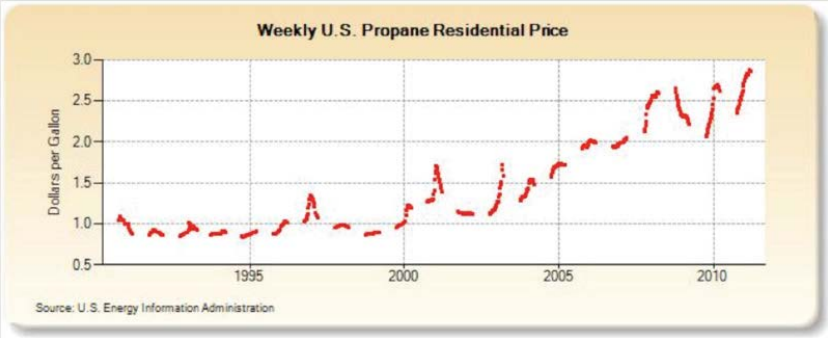
Use the following table to record information about your natural gas consumption.

Natural Gas Data	
My natural gas utility is…	
My total consumption per year is…	
My average consumption per month is…	
My cost per unit is…	

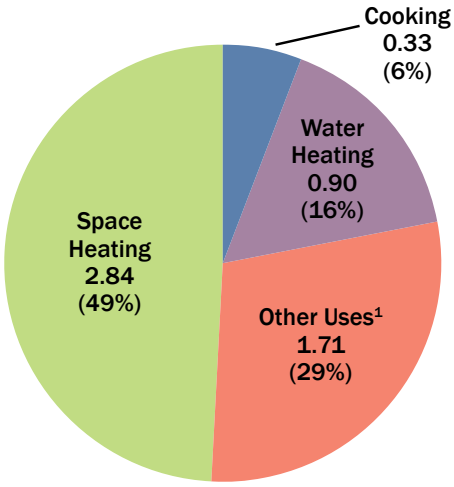
Propane

Propane is a liquefied petroleum gas. It is found mixed with natural gas and oil and is separated in the refining process. In the home, it is used for space heating (49 percent), other uses (such as clothes drying, gas grills, etc) (29 percent), water heating (16 percent) and cooking (6 percent). Agricultural operations may use propane. Some examples might include livestock barn heaters or water heating in dairy barns.

Because propane is linked to petroleum extraction and refining, propane pricing follows petroleum pricing. Like natural gas, the residential price will fluctuate due to delivery costs, storage, forward contracting and other factors. However, like other petroleum products, the price has escalated, especially in the past five to seven years.



Residential Propane Consumption by End-Use, 2009



[1]Other uses include clothes drying, outdoor grills, mosquito traps etc.

Source: U.S. Energy Information Administration, Annual Energy Outlook 2011, Table 4 (April 2011)

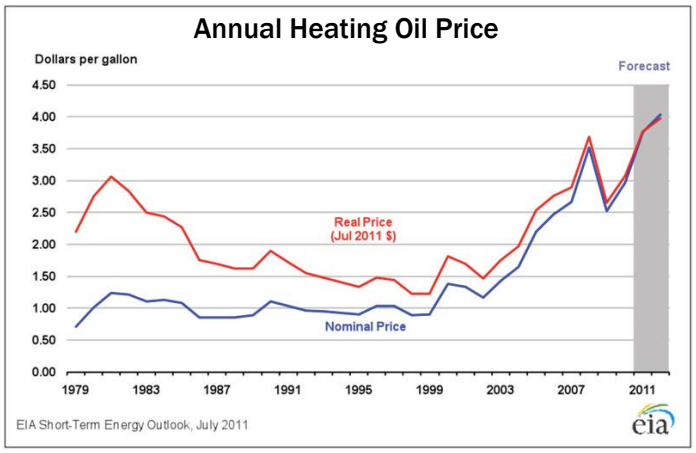
My Propane Data

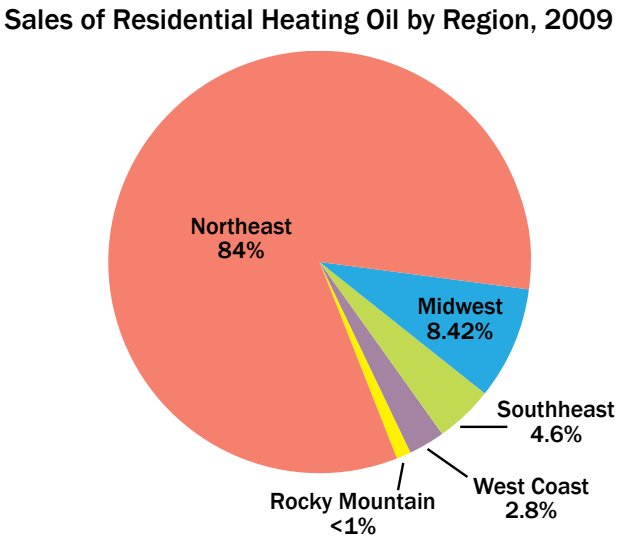
Use the following table to record information about your propane consumption.

Propane Data	
My propane supplier is…	
My total consumption per year is…	
My average consumption per month is…	
My cost per unit is…	

Heating Oil

Another petroleum-based product used for heating is heating or fuel oil. Its use is less common in the Rocky Mountain region, but some homes do use heating oil. The Northeastern region uses most of the heating oil in the United States. Prices for heating oil trend with petroleum.





Source: U.S. Energy Information Administration, Fuel and Kerosene Sales 2009 (February 2011)

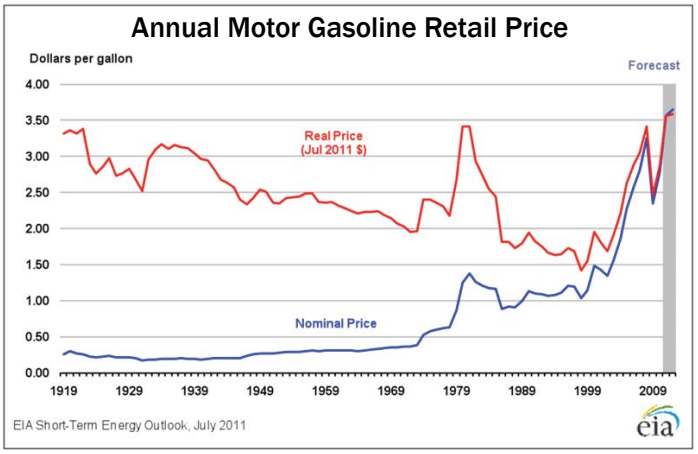
My Heating Oil Data

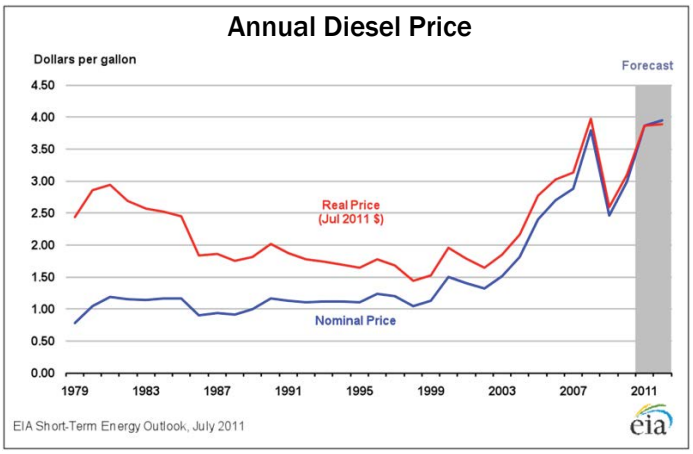
Use the following table to record information about your heating oil consumption.

Heating Oil Data	
My heating oil supplier is…	
My total consumption per year is…	
My average consumption per month is…	
My cost per unit is…	

Transportation Fuels

In the United States, petroleum is our number one source for transportation fuels. Personal vehicles account for most of that consumption. Prices for transportation fuels, both in real and nominal terms have escalated significantly in recent years.





My Transportation Fuel Data

Use the following table to record information about your transportation fuel consumption.

Transportation Fuel Data	
My total gallons of gasoline per year is…	
My average price per gallon of gasoline is…	
My total gallons of diesel fuel per year is…	
My average price per gallon of diesel fuel is…	

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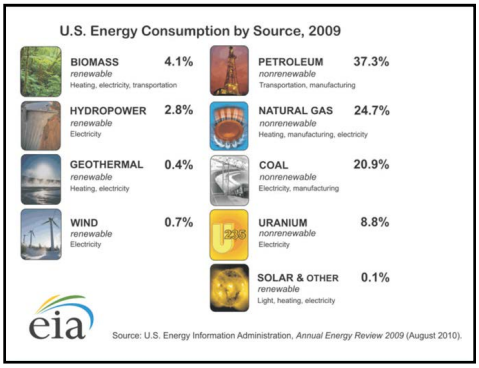
User's Guide

Sources and Uses of United States Energy

Making informed decisions about energy requires understanding where energy comes from (sources) and how it is used.

Primary Energy Sources

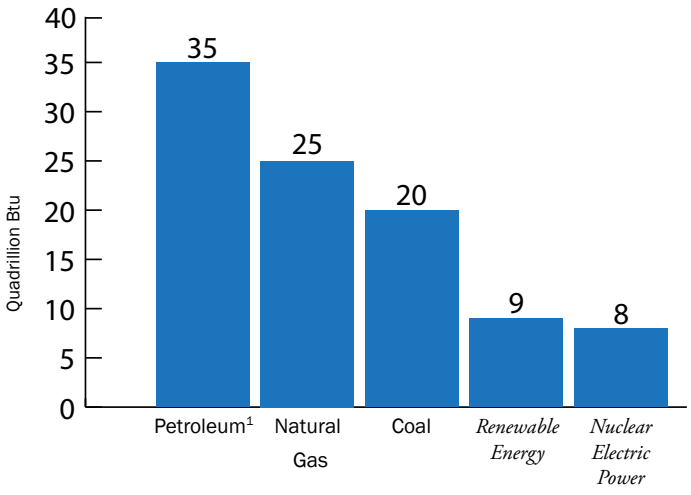
Primary energy sources are petroleum, coal, natural gas, nuclear fuel, and renewable energy. These primary fuels are used to make secondary sources of energy, like electricity. The top three primary energy sources consumed in the United States are petroleum (37 percent), natural gas (25 percent), and coal (21 percent). Primary energy sources are divided into two categories – renewable and nonrenewable.



Nonrenewable Sources

The top four primary energy sources in the United States are nonrenewable – coal, petroleum, natural gas, and uranium. *Nonrenewable* resources are those that cannot be replenished in a short time period (they are consumed faster than they are able to regenerate). They are extracted from the ground. Fossil fuels (coal, oil, natural gas) fall into this category. Fossil fuels formed millions of years ago when plants and animals died, decomposed and were buried under layers of earth. Fossil fuels have high percentages of carbon.

Primary Energy Use by Source, 2011



[1] *Petroleum products supplied, including natural gas plant liquids and crude oil burned as fuel. Does not include biofuels that have been blended with petroleum—biofuels are included in "Renewable Energy."*

Source: U.S. Energy Information Administration / Annual Energy Review 2011 http://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf *(p 28)*

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All fossil fuel sources are nonrenewable, but not all nonrenewables are fossil fuels. Uranium is a nonrenewable resource, but is not a fossil fuel.

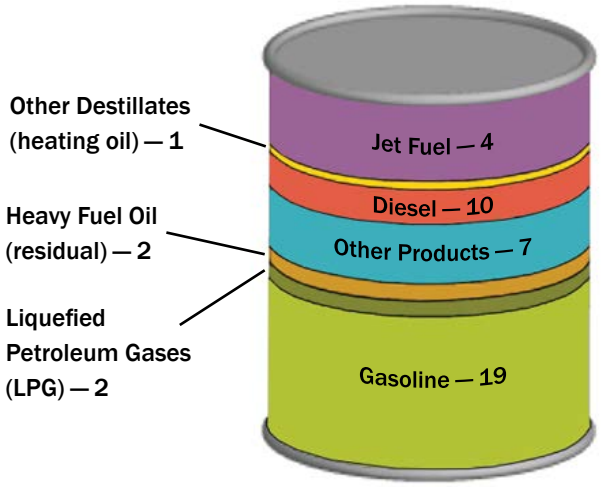
Renewable Sources

Renewable energy sources regenerate and are sustained indefinitely. Sources of renewable energy include biomass, hydropower, geothermal, wind, and solar. Use of renewable energy is not new. Wind power was used for pumping water and grinding throughout ancient history. Wood (biomass) supplied 90 percent of United States energy needs more than 150 years ago. As the use of other resources expanded, reliance on renewable resources waned. Today, we are again looking for ways to incorporate renewable energy into our total energy portfolio, however renewable energy currently represents only 8 percent of our total energy source.

Sources and Uses

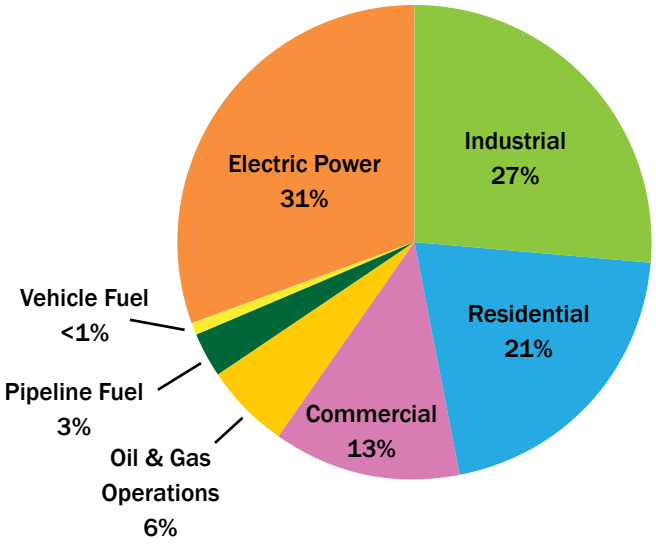
- **Petroleum** is the basis for oil products and gasoline production. Through refining, petroleum is converted into a variety of products, mostly related to transportation fuels.
- **Natural gas** is used to heat slightly more than half of the homes in the United States, but 31 percent of the supply is also used to generate electricity. Natural gas is used in industrial manufacturing as an input in agriculture-related products, such as nitrogen fertilizers, and to make plastics.
- Ninety-three percent of **coal** production is used at power plants to generate electricity. Power plants burn coal to create steam in order to power electrical generators. Roughly half of the electricity supply in the United States comes from coal.

Products Made from a Barrel of Crude Oil (Gallons) 2010



Courtesy of US Energy Information Administration, Annual Energy Review 2009, (August 2010)

Natural Gas Use, 2010

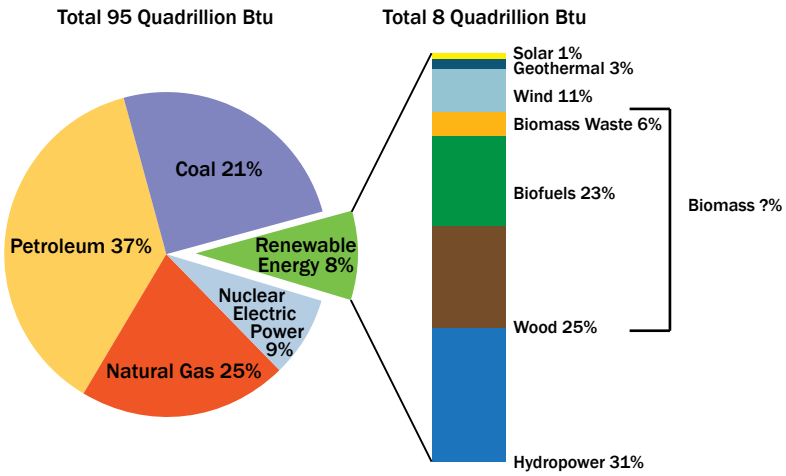


Source: U.S. Energy Information Administration, Natural Gas Monthly (April 2011)

- **Renewable energy** makes up about 8 percent of U.S. total energy supply and was about 10 percent of the electricity supply in 2010. Hydropower is the largest renewable energy resource, representing 31 percent of the supply.
- **Nuclear energy** represents approximately 22 percent of the US electricity supply or about 8 percent of the total energy supply. Nuclear energy is created from uranium using nuclear fission.

Another way of considering sources and uses is in the graph below, which shows the primary sources of energy and the primary demand sectors (users) of energy in the U.S. This graphically illustrates many interesting things about the way we use energy. For example, we can see that 94 percent of our transportation fuels come from petroleum sources – meaning that we have few options to "switch" to other sources of

U.S. Energy Consumption by Energy Source, 2010



Source:

Can't decypher the source and the biomass percentage

supply when petroleum prices change or if the supply chain were compromised.

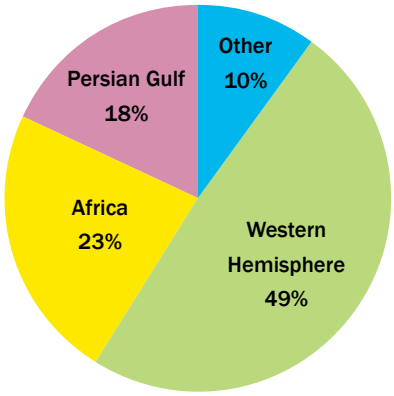
We can also see that only 3 percent of the transportation supply comes from renewable energy (biofuels). In addition, the graph shows that 93 percent of coal supply is used for electrical generation, but that coal is only 48 percent of the total supply for electrical power generation. This graph further shows that most renewable energy is related to electrical generation (either for electrical power production or in industrial or residential applications).

About Imported Sources of Energy

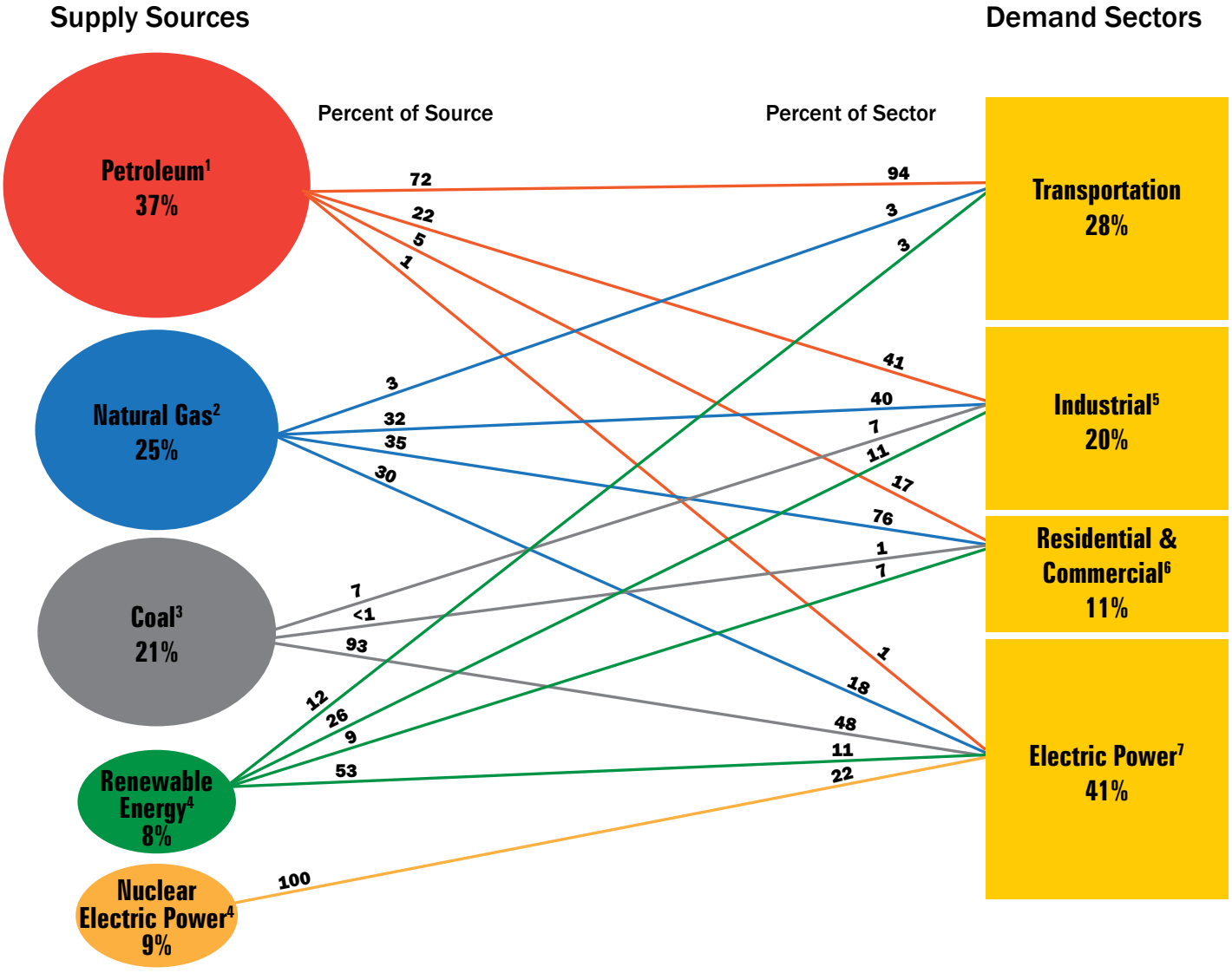
National independence is a common topic in today's energy conversations. However, there are many misconceptions regarding our dependence on foreign sources of energy. Only 24 percent of total U.S. energy supply was imported in 2009. However, the US imports roughly 60 percent of its **petroleum** supply on an annual basis.

It may surprise you to learn where our imported petroleum is coming from. In 2010, 49 percent of imported petroleum came from the Western Hemisphere. Canada is our number one supplier of petroleum, but countries in Central and South America, as well as the Caribbean Islands provide almost half of our total supply. Even though Saudi Arabia is the second largest supplier of U.S. imported petroleum, the total Persian Gulf region accounts for 18 percent of total petroleum imports.

Sources of U.S. Net Petroleum Imports, 2010



Source: U.S. Energy Information Administration, Petroleum Supply Monthly (February 2011), preliminary data



Source: U.S. Energy Information Administration, Annual Energy Review (August 2010)

Energy Use in Homes

According to The U.S. Energy Information Administration, the type of energy consumed the most in U.S. homes is natural gas (45 percent). Most of the natural gas is used for space heating. Electricity comes in second at 41 percent. Most of the electricity is used for lighting and appliances.

The statistics are similar for homes in Montana and Wyoming. For Montana homes, the greatest amount of energy consumed is natural gas (44 percent). Most Montana and Wyoming homes heat living space with natural gas. It is used also for heating water. The second most common energy type is electricity at 32 percent of the total used.

Energy Use in Agriculture

Energy use varies by type of operation (poultry farm versus a dry land operation), so general averages are less meaningful when considering agricultural energy uses. There are several common areas of energy consumption in agriculture; however, the fuel types used may differ by operation. The categories of key agricultural energy consumptions include:

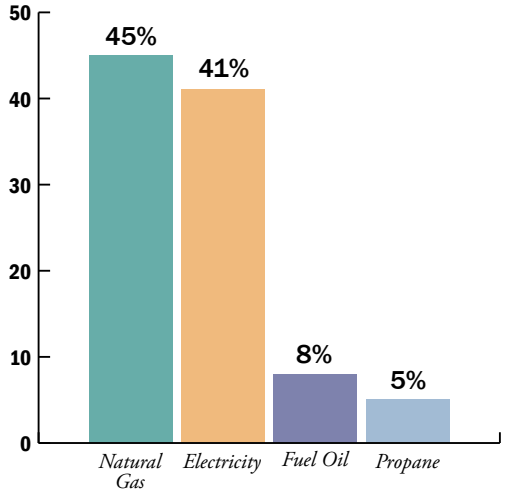
- Tractor and field operations,
- Irrigation systems,
- Indoor and outdoor lighting,
- Farm shop energy use,
- Livestock building energy use,
- Grain drying, and
- Livestock watering systems.

Of course, the home energy consumption of most agricultural operations is also significant.

Why does this information matter to me?

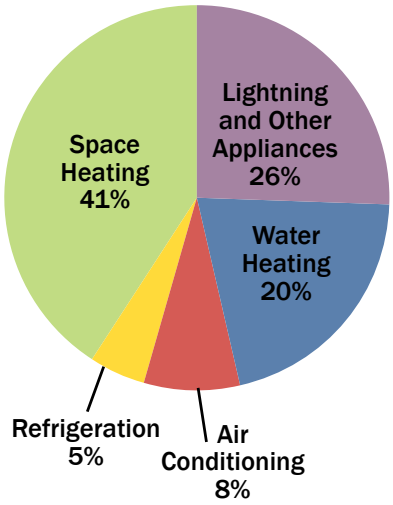
The relevance of the sources and uses of energy often relates to your objectives in exploring energy alternatives. For example, if your primary objective in making changes to your energy consumption is to reduce dependence on imported sources of energy, you should focus on reducing or producing transportation fuels. If your objective is to reduce fossil fuel consumption, you may wish to consider your largest use of fossil fuels as a place to start. Is personal consumption higher in transportation fuels or natural gas consumption for heating your home? Understanding what energy sources you are using and how those sources and uses relate to your objectives can help you to align your energy goals.

Types of Energy Consumed in Homes, 2005



Source: US Energy Information Administration, 2005 Residential Energy Consumption Survey,

How Energy Is Used in Homes, 2005



Source: US Energy Information Administration, Residential Energy Consumption Survey 2005.

Examples of Alternative Energy Sources that Address Current Energy Uses	
Current Energy Use	**Alternative Energy Source**
Electricity	Wind Turbine Photovoltaic Panel Micro-Hydro System Anaerobic Digester
Hot Water *(Current source may be electric, gas, or propane)*	Solar Thermal System Concentrating Solar Power Technology/Parabolic Trough Geothermal (desuperheater)
Heated Air *(Current source may be electric, gas, wood, or propane)*	Solar Air Collector Transpired Solar Collector Geothermal (Ground Source Heat Pump) Biomass Passive Solar Design
Transportation Fuel	Biofuel Renewable Electricity (for electric or hybrid vehicles)

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US Energy Information Administration. (2010). *Annual Energy Outlook 2010.* Retrieved June 2010, from Energy Outlook: http://www.eia.doe.gov/oiaf/aeo/pdf/trend_1.pdf

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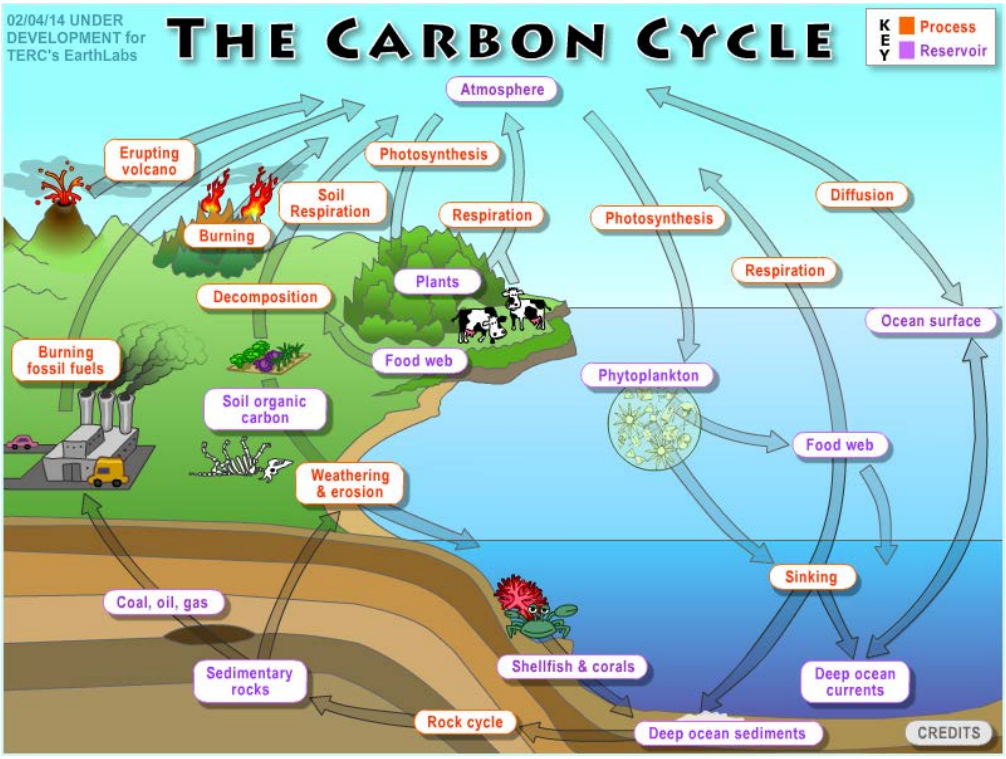
User's Guide

Carbon and Energy in the United States



The Carbon Cycle. Source: Informmotion/TERC. http://serc.carleton.edu/eslabs/carbon/2c.html
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The study of greenhouse gases (GHG) began in the late 19th Century when scientists began to understand that the Earth's atmosphere contains gases that help to warm the planet and support life by absorbing and emitting radiation (greenhouse effect). Without these naturally occurring gases, the Earth's temperature would be about -2 degrees Fahrenheit, as opposed to the +57 degrees Fahrenheit that we currently experience (EIA, 2011). One of these gases is carbon dioxide.

All living things are based on the carbon atom. Carbon can exist as a solid, liquid, or gas and carbon molecules are constantly being exchanged. Whether through plants and animals decaying and evolving into mineral carbon (fossil fuels) or plants completing photosynthesis, carbon is an essential element of our world. In a completely natural world, the levels of carbon dioxide are balanced by natural processes, for example the relationship between plants and animals. Plants absorb carbon dioxide and produce oxygen – while animals use oxygen and produce carbon dioxide. However, we do not live in a completely natural world. Over 150 years ago when large-scale industrialization began, humans began burning fossil fuels for energy. As fossil fuels (mineral carbons) are burned, additional carbon dioxide is released into the atmosphere. The amount released is more than what can be naturally balanced and the concentration of several important

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GHG have increased by about 40% since industrialization began (EIA, 2011). (In addition to carbon dioxide, other GHGs considered important are methane, nitrous oxide, hydroflorocarbons, perflurocarbons, and sulfur hexafluoride (EIA, 2011).) Scientists have been concerned for many decades that these higher concentrations of GHGs will enhance the greenhouse effect, contributing to increased temperatures and changed climates on Earth.

The topic of climate change and global warming is extremely controversial. However, we do know that GHG's help to warm the planet and that human activities, such as burning fossil fuels, do create additional greenhouse gases. Therefore, many public policies have been enacted in an attempt to reduce the net amount of additional carbon released into the atmosphere.

How is the Topic of Carbon Related to Energy?

The reason that carbon is so heavily discussed in energy is that fossil fuels supply 84% of the primary energy sources consumed in the United States and they produce 99% of carbon dioxide emissions (EIA, 2011). If total GHGs are considered, about 87% of 2009 emissions in the U.S. came from energy-related sources (EIA, 2011).

Electricity generation and transportation are the two largest sources of energy-related greenhouse gas emissions. According to EIA, the electrical power industry currently emits the most greenhouse gas. However, petroleum is the fossil fuel that emits the most carbon dioxide (EIA, 2011).

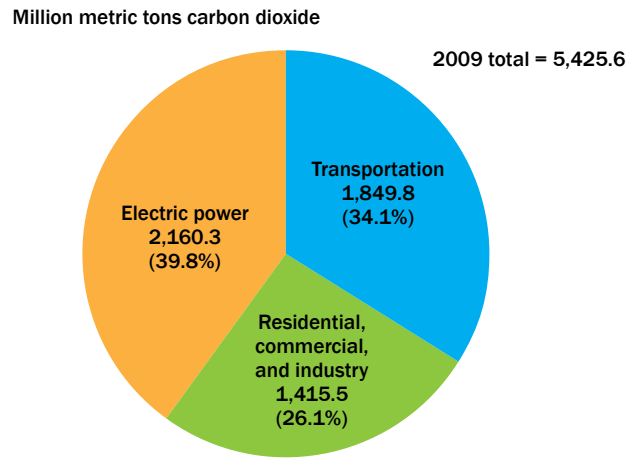
Determining Your Carbon Contributions

Because energy is used in homes, vehicles, and manufacturing products, almost all U.S. consumers are associated with GHG emissions. Recently, many organizations have tried to help consumers understand the extent to which they contribute to the emission of GHGs (especially carbon) by estimating the "footprint," or carbon impact, of each consumer. These calculations are often referred to as "carbon footprints." An example of a calculator developed by the U.S. Environmental Protection Agency can be found at www.epa.gov/climatechange/emissions/ind_calculator.html.

Considerations in Using Carbon Footprint Calculators

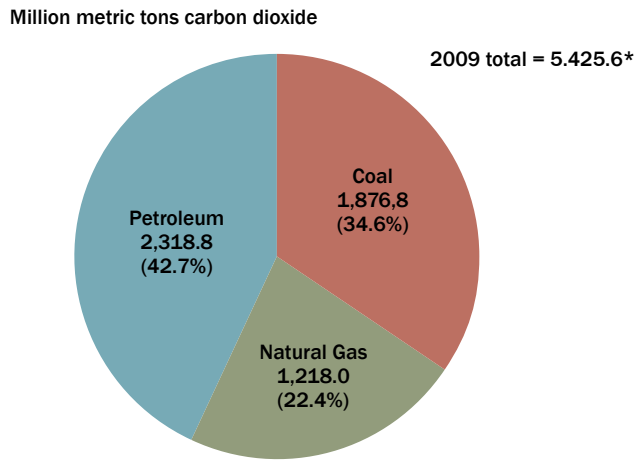
The concept behind carbon footprint calculators is to help consumers understand how decisions made by individuals contribute to the larger world issue of carbon emissions. Some retail chains have even started to label products with carbon footprint indicators so that consumers can be more aware of their purchasing decisions as they relate to the environment. However, there are no defined standards for calculations. Consumers who use the Internet to find carbon footprint calculators may find that the size of their "footprint" is different from website to website. The differences are usually attributed to the assumptions being made in the calculation. For example, one calculator might look at the carbon footprint of a product at the point of manufacturing to the end purchase. Another might look at the same product, but consider everything from harvesting the raw materials and transporting those materials to the manufacturer through disposal of any packaging.

U.S. Energy-Related Carbon Dioxide Emissions by Sector, 2009



Source: U.S. Energy Information Administration. Emissions of Greenhouse Gases in the United States 2009. http://www.eia.gov/environment/emissions/ghg_report/pdf/0573%282009%29.pdf

U.S. Energy-Related Carbon Dioxide Emissions by Major Fuel, 2009



**Includes small amounts of CO_2 from non-biogenic municipal solid waste and geothermal energy (0.2% of total)*
Source: U.S. Energy Information Administration. Emissions of Greenhouse Gases in the United States 2009. http://www.eia.gov/environment/emissions/ghg_report/pdf/0573%282009%29.pdf

The assumptions made in calculations and the recommended "offsets" (or actions people can take to reduce their own footprint) remain a controversial topic. The calculators can, however, help you to better understand where you are most impacting carbon emissions. If your primary objective in making changes to your energy use is to reduce fossil fuel consumption, these calculators can help you to better understand where your actions will have the greatest impact (changing transportation choices, reducing electricity consumption, etc.) You can then use information in the E3A toolkit to determine the course of action that is right for you.

References

EIA. (2011, May 9). *US Energy Information Administration*. Retrieved August 3, 2011, from What are greenhouse gases and how much are emitted by the United States?: http://www.eia.gov/energy_in_brief/greenhouse_gas.cfm

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Notes

E3A: User's Guide Assessment and Fact Sheets

Authors: Sarah Hamlen; Mike Vogel and Milton Geiger eds. E3A Program

User's Guide

Importance Scale of Alternative Energy Objectives

Name:

Age:

Community:

Application (circle one): Home Farm/Ranch

For each question below, circle the number to the right that best fits your opinion on the importance of the issue. Use the scale above to match your opinion.

Economic Considerations	Scale of Importance				
	Not at all	Not very	No Opinion	Somewhat	Extremely
I want to save money now.	1	2	3	4	5
I want to save money in the future, but do not expect immediate savings.	1	2	3	4	5
Independence from Existing Energy Sources	**Scale of Importance**				
	Not at all	Not very	No Opinion	Somewhat	Extremely
I want personal independence from the local electrical utility.	1	2	3	4	5
I want to contribute to national energy independence and reduce imports of foreign energy.	1	2	3	4	5
Concern for the Environment	**Scale of Importance**				
	Not at all	Not very	No Opinion	Somewhat	Extremely
I want to reduce fossil-fuel based energy generation.	1	2	3	4	5
I am interested in personal sustainability – I want to reduce my impact on natural resources.	1	2	3	4	5
Educational	**Scale of Importance**				
	Not at all	Not very	No Opinion	Somewhat	Extremely
I am interested in educating myself and my neighbors about renewable energy systems.	1	2	3	4	5
I want to install a renewable energy system to increase interest and awareness of renewable energy in my community.	1	2	3	4	5
I have curiosity about renewable energy – I want to install a system just to learn more about it.	1	2	3	4	5

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