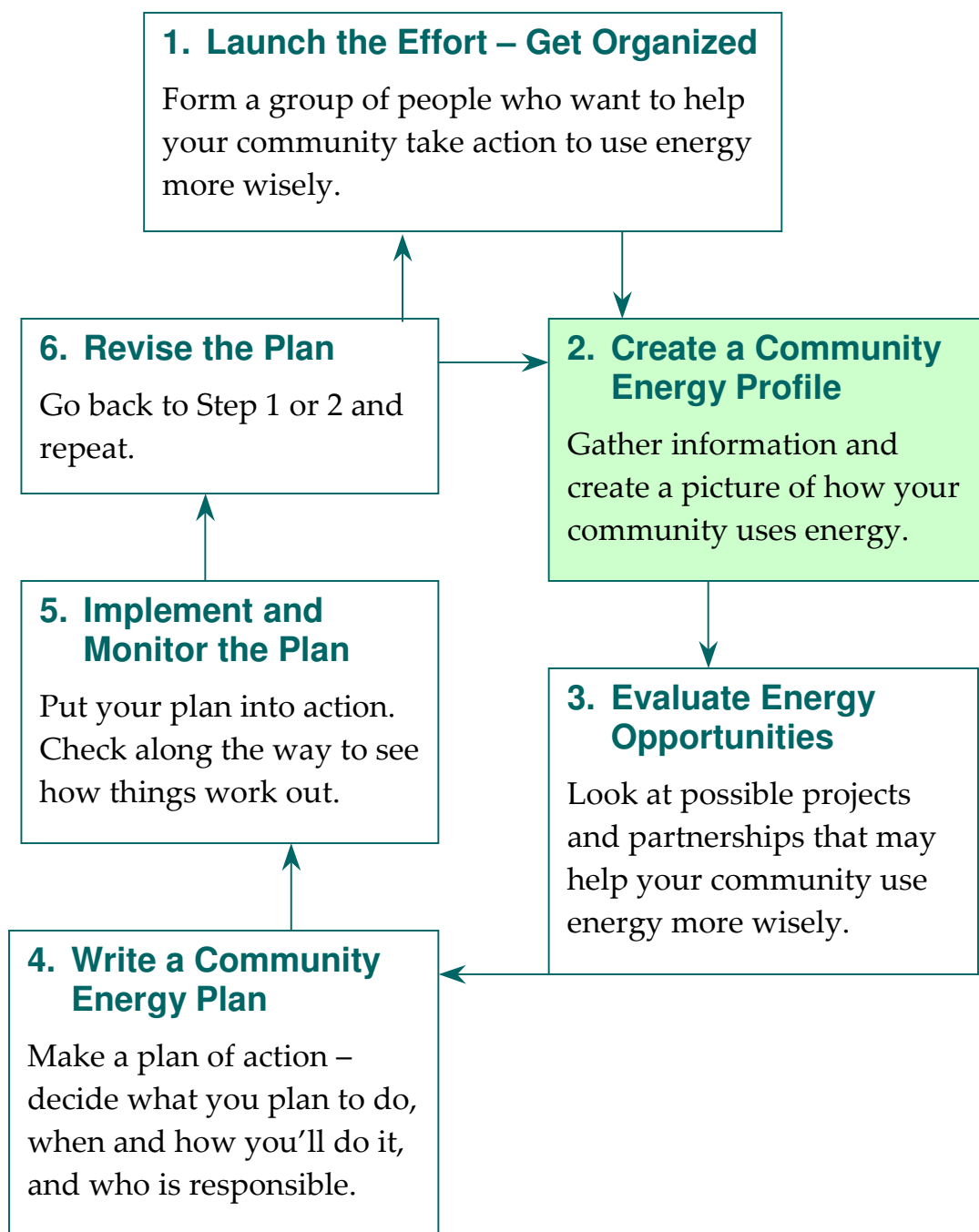


Step 2 of the 6-step Community Energy Planning Process



Contents Step 2:

Create a Community Energy Profile

Once you complete **Step 1: Launch the Effort – Get Organized** you move to **Step 2: Create a Community Energy Profile**. This section of the toolkit has guidelines, worksheets, samples, and practical information to help you create a community energy profile.

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What is a community energy profile?

A community energy profile gives you a clear picture of how your community uses energy. You need to understand how the community uses energy right now before you begin to find ways to use energy more wisely, save energy, and make your community more sustainable.

A community energy profile describes:

- What fuels a community uses to produce energy and how much energy you use.
- How much money a community spends on energy.
- How much greenhouse gases each fuel produces.
- How much waste heat the diesel power plant produces.
- How much energy a community uses in homes, other community buildings, and for transport within the community.
- Some basic ideas a community can explore to use less energy, produce less greenhouse gases, and save money

A Community Energy Profile usually does NOT include energy related to air and truck transport that bring goods into the community.

In this toolkit we use two formats to record the energy profile, to help the energy committee and energy coordinator share the information with the community:

- A poster that shows a summary of the energy profile.
- A report that explains some details of the poster.

How do you create a community energy profile?

To create an energy profile you need to:

- Define the physical boundary and year of the study.
- Collect data from fuel suppliers.
- Collect data from community energy users energy.
- Use the data to create a community energy profile poster.
- Use the data to create a community energy profile report.

The toolkit includes worksheets you can use to collect and analyze all the information you need to create a Community Energy Profile. It includes a sample and template of a community energy profile report and poster.

You can create the community energy profile poster on an Excel spreadsheet with a computer, OR you can do it without the Excel spreadsheet and draw it by hand or on a computer. The toolkit includes information to do it both ways.

A Community Energy Profile shows how a community uses energy for a certain year. It contains basic information that is easy to find and easy to find again in the future. You can update the profile and keep track of how your community's energy use changes over time, and if and how it improves.

The energy coordinator and the Community Energy Planning Committee organize and oversee the work, and may also help gather information.

Who does the work to create a community energy profile?

The coordinator and the community energy committee need to decide who will do the work and how much it will cost. The energy coordinator and members of the committee may do some of the work themselves, or they may find others to do the work.

As with all steps in the energy planning process, if local people do the work the whole community benefits. You can gather information and create your own energy profile. You may also choose to pay a consultant. See Step 1: Launch the Effort – Get Organized for guidelines to write a request for proposals (RFP) and to hire a consultant.

Once you decide who will do the work, meet with them and review this section of the toolkit. As well as researchers, other individuals, businesses, and agencies might get involved to help gather information for the community energy profile, and create the poster and report:

- Utility representatives
- Energy professionals and consultants
- Fuel suppliers and distributors
- Housing Corporation representatives
- Environmental groups
- Church groups
- Youth groups

Define the physical boundary and year of the study

The first things you need to do to create a community energy profile are to define the physical boundary and decide the year of the study. Use the most recent one-year period for which you have complete information about energy use in your community.

The physical boundary clearly defines what people and buildings are part of the study. For example, does the study include everything within a municipal boundary, things beyond the municipal boundary, or a smaller physical area?

The study provides data to create the energy profile - step 2 in the energy planning process. The information in the energy profile affects Step 3: Evaluate Energy Opportunities and Step 4: Create a Community Energy Plan. As each step in the energy planning process connects with other steps in the process, one important factor that helps you define the physical boundary of the study is the type of community energy plan you want to aim for.

What type of energy plan do you want to aim for?

The energy coordinator and the community energy planning committee need to decide what type of community energy plan is best for your community, to help move towards your vision and general targets.

Here are three general types of community energy plans done by other communities:

1. Comprehensive Community Energy Plan

- Looks at all aspects of energy production and energy use in a community.
- Includes detailed technical and economic analyses.
- Needed as part of gas tax requirements.

2. Specific Issues Community Energy Plan

- Looks at a few, specific aspects of energy production and energy use in a community – for example, the economics of installing a wind turbine to produce electricity.

3. Integrated Approach

- Includes energy issues into other community plans such as a Municipal Plan or an Integrated Community Sustainability Plan.

Another way to think about different types of community energy plans is in terms of the areas of community energy production and energy use that the energy plan covers. An energy plan may cover many of the following areas or just a few:

- **Land use:** Community design and zoning affect energy use. For example, people need energy for transport if they can't walk to school or work. Housing lots that face south allow homes to benefit from passive solar gain.
- **Energy production:** Communities get most of their energy from imported, non-renewable fossil fuels.

Some communities also use some renewable sources of energy.

- **Buildings – electricity:** Residential, commercial, and institutional buildings use energy for electricity.
- **Buildings – heating:** Residential, commercial, and institutional buildings use energy for space heating and to make hot water.
- **Community services and infrastructure:** Communities use energy for things such as garbage, streetlights, sewer and water, snow plowing, etc.
- **Transport within the community:** People use energy to transport things within the community.
- **Transport outside the community:** People use energy to transport things into and out of the community.
- **Industrial:** People use energy to operate industries such as a mine, fish plant, saw mill, etc.

Use the information about different types of community energy plans to help define the physical boundary of the study and to decide what type of community energy plan you want to create. Once you define the physical boundary and year of the study, you're ready to start to collect data.

Collect data from fuel suppliers

To begin the study, collect data from fuel suppliers. List all the different fuels that your community used in the study year and identify the individuals, agencies, and businesses that supply fuel.

Energy Fact

NWT communities import most of their fuel: diesel for electricity and vehicles, heating oil, and gasoline. Many communities also use locally harvested firewood for heating.

A few communities use hydro-electricity or natural gas as sources of energy.

Gather information from all the people and businesses that supply fuel to your community. Find out how much fuel they import in a year and how much they pay for it. Here is a list of possible sources of information about fuel suppliers:

- Petroleum Products Division
- Public Utilities Board
- Northwest Territories Power Corporation
- Gas stations
- Heating fuel suppliers

Start with the power plant and the places in your community where people buy heating oil and fuel for their vehicles. Gather information from any individuals, groups, and businesses that import their own fuel. The profile usually does not include energy used outside the community, so you do not gather information

about aircraft fuel.

Write a letter to each fuel supplier to explain your project and to outline what information you need and why. The Toolkit includes a sample letter.

Fill out a copy of Worksheet 2-1 for each fuel supplier. The worksheet collects and summarizes the information about the different kinds of fuel your community uses, the amount of fuel your community imports in a year, and how much it costs. Page 2 of the worksheet provides a breakdown of electricity use.

An important note about firewood:

If you include wood as a fuel, you may have to gather data from other sources or guess. The fuel supplier survey may not give you the best information about how much wood your community uses. For example, many people may go out and cut their own wood.

One approach is to call the community office and ask them to estimate how many homes use wood for heat, how many cords a typical house uses, and how much they pay per cord.

This data depends a lot on what kinds of woodstove people use and how energy efficient their houses are. For example, an inefficient house can burn 10 cords per year and an efficient one with an efficient stove can burn 2 or 3 cords.

You'll have to make certain assumptions. Just be sure to clearly note the assumptions you make – the number or percent of homes that burn wood, how many cords each burns, and the price per cord people pay.

Sample letter to energy supplier

Energy supplier's name and address

Your name and address, unless you use letterhead

November 14, 2006

Dear Sir or Madam,

Our community is working to create a community energy plan and we need your help. A community energy plan shows what action we plan to take in the future to use energy more wisely. To develop a plan that best suits the needs of our community, we first need to understand how we use energy right now – we need to create an energy profile.

To gather data for the energy profile, we're asking each energy supplier in our community to fill out a form, to tell us how much fuel our community used in a year and how much it cost. Our study is for the year April 2005 to March 2006.

Please fill out the attached form and return it to us by December 7, 2006. If you have questions, please call us at 867-123-4567.

Thanks for taking the time to participate in this important work. We believe our whole community will benefit from a community energy plan.

Sincerely,

Worksheet 2-1: Survey Community Fuel Suppliers

(1 of 2 pages)

Use this worksheet to gather data about how much fuel your community uses in a year.

- Use a separate sheet for each fuel supplier.
- Choose a particular year to study – the most recent year for which you can get all the relevant information.
- Fill out page 2 of the survey for a breakdown of electricity.

Community:

Year:

Fuel supplier: (gas station, power plant, firewood cutter, etc.)

Contact person:

Phone #:

Type of fuel: (diesel, gasoline, wood, heating oil, etc.)

Fuel end use: (electricity, heating, transport, etc.)

Yearly amount: (clearly note units such as litres, cords, kWh, etc.)

Yearly cost:

Worksheet 2-1: Survey Community Fuel Suppliers

(2 of 2 pages)

Electricity breakdown – electric utility only

To the electric utility: Please give a breakdown of how many kilowatt hours (kWh) produced for residential, general, and streetlights, and the cost for each one.

	Yearly cost	kiloWatt hours
Residential	\$	KWh
General	\$	KWh
Streetlights	\$	KWh
Total	\$	KWh

Total yearly cost ÷ Total kWh = Average cost per kWh

\$ ÷ kWh = \$

Comments:

Collect data from community energy users

If you want more detailed information about where your community uses fuel, you can do a door-to-door survey. You can add up fuel bills for electricity, heating, and transportation, and gather other information about energy use.

This method takes more time and people may not have the records you need. You don't have to do this to create a community energy profile. We believe the data from the energy supplier surveys gives you enough accurate data to suit the purposes of the community energy profile.

If you decide you want to collect detailed information use Worksheet 2-2 to collect the data. The Toolkit includes a copy of this worksheet and a sample letter to go with it. Distribute a copy of the letter and worksheet to each home in your community, or go door-to-door to fill out the survey in person.

Sample letter – Survey household energy use

Community Energy Planning Committee
Community name

November 14, 2006

To all the homes in our community,

Our community is working to create a community energy plan and we need your help. A community energy plan shows what action we plan to take in the future to use energy more wisely.

To create an energy plan that best suits the needs of our community, we need to understand how we use energy right now. We need to create an energy profile.

To create the profile we're asking each home to fill out a confidential survey about your energy use. We'll add up the information from all the surveys to find out how much fuel our community used in a year and how much it costs. Our study is for the year April 2005 to March 2006.

Please fill out the attached form and return it to us by December 7, 2006. If you have questions about the form or about energy planning in our community, please call us at 867-123-4567.

Thanks for sharing information and your ideas. Our community energy plan will help us use less energy and save money, and our whole community will benefit.

Sincerely,

Worksheet 2-2: Survey household energy use

ID Information

Community:

Date:

First and last name:

Number of people living in the home, including children:

Signature:

Energy issues in your community

Rank the top three energy issues in our community – 1, 2, 3.

Energy costs	
Greenhouse gas emissions and climate change	
Local jobs	
Local environmental impacts – eg. noise or pollution	
Local versus outside ownership	
Local versus imported sources of energy	
Leadership in technical development	
Other – please describe	

Energy issues in your community

What actions do you think our community could take to use energy more wisely? Name one or two ideas you have.

Do you think climate change makes your environment different? If yes, please give one or two examples of how things are different.

Energy consumption in your home**Who owns your home?**

- ☐ Yourself or another local person or business
- ☐ Local housing authority or other government agency
- ☐ Other _____

Does someone subsidize your energy bills?

- ☐ Yes
- ☐ No
- ☐ Don't know

Check each type kind of energy you use and estimate how much money you spend in a year:

Fuel	Total cost	Use/year	Price/unit
<input type="checkbox"/> Oil	\$	litres	\$ /litre
<input type="checkbox"/> Electricity	\$	kWh	\$ /kWh
<input type="checkbox"/> Natural gas/Propane	\$	litres	\$ /litre
<input type="checkbox"/> Firewood	\$	cords	\$ /cord
<input type="checkbox"/> Other _____	\$		\$

Do you turn down the heat at night or when you're not home?

- ☐ Yes
- ☐ No
- ☐ Don't know

Tip: If you turn down the heat at night you save money and energy. Get a thermostat that automatically turns down the heat and turns it up in the morning before you get out of bed.

Energy consumption in your home

What kind of stove do you cook on? Check all that apply.

- ☐ Electric
- ☐ Gas or propane
- ☐ Microwave
- ☐ Other _____

Tip: Cooking with propane costs less than cooking with electricity. Microwaves use less electricity than electric stoves.

What kind of hot water heater do you have?

- ☐ Electric
- ☐ Gas or propane
- ☐ Oil
- ☐ Other _____

Tip: Depending on where you live, oil fired hot water heaters may be cheaper to operate than electric hot water heaters.

How old is your hot water heater? _____ years

Tip: Water heaters usually last about 10 years. When it's that old, get a new, energy efficient water heater.

What temperature do you set your water heater at? _____ °C

°Fahrenheit	32	50	68	86	104	122	140	158	176	194	212
°Celsius	0	10	20	30	40	50	60	70	80	90	100

Tip: Set your water heater at 49°C (120 °F) – high enough to kill germs. If you set it higher you waste energy and people might get burned.

Energy consumption in your home

Do you have an insulation blanket on the outside of your hot water heater?

- ☐ Yes
☐ No

Do you have insulation on your hot water pipes?

- ☐ Yes
☐ No

Tip: Insulation helps keep the heat in your water heater and pipes, and you pay less for hot water.

How many light bulbs do you have in your house? _____

How many are compact fluorescent bulbs? _____

Tip: You save energy and money if you use compact fluorescent bulbs. They use $\frac{1}{4}$ of the energy and produce the same light.

Do you have an Energy Star washing machine?

- ☐ Yes
☐ No

Tip: ENERGY STAR is a symbol for products that use less energy – ovens, fridges, freezers, stoves, dishwashers, computers, and TVs.



What other Energy Star products do you have in your home?

Energy consumption transportation**Do you own a car or truck?**

- ☐ Yes
☐ No

If yes, please give the following details for each vehicle.

Vehicle 1**Vehicle 2**

Make:

Model:

Year:

Type of fuel:

km you drive in a year:

Fuel use per year:

Fuel cost per year:

Do you have a timer on your engine block heater?

- ☐ Yes
☐ No

Tip: Save energy and money. Use a timer to automatically turn on the block heater - plug in your vehicle only when you need to. When it's colder than -20 °C set the block heater to go on for two hours before you need to drive.

How many minutes do you idle your vehicle on a winter day?

Tip: Idling for over 10 seconds uses more fuel than restarting your engine. Idling pollutes the air with carbon dioxide, which contributes to climate change. Idling wastes gas and money.

Energy consumption transportation

Do you own a snow machine, motorboat, or ATV?

☐ Yes

☐ No

If yes, please give the following details for each:

	Snow machine	Motor boat	ATV
Make:			
Model:			
Year:			
2-stroke or 4-stroke:			
# km you drive in a year:			
Fuel use per year:			
Fuel cost per year:			

Tip: 4-stroke motors save money. They use less fuel, create less exhaust, and are quieter and more reliable than 2-stroke motors.

Thanks for completing the community energy survey.

For more information about community energy planning, contact your energy coordinator or your community energy planning committee at _____.

Sample energy profile poster

The poster shows a summary of the energy profile of your community. See a sample poster on the next page. The Toolkit includes a larger, 11x17 sample poster in Appendix 2-B.

The middle of the poster is a photo of your community. To the left of the photo, the arrows show categories of fuel coming into your community. To the right of the photo, the arrows show how your community uses energy based on homes, other buildings, and transport.

Each energy category has a different colour arrow. The width of the arrow shows the percent of total energy. The poster also shows fuel costs, greenhouse gas emissions, waste heat from the diesel generator at the power plant, and basic information about energy efficiency and renewable sources of energy.

The poster shows total energy use, total costs, and total greenhouse gas emissions. It compares greenhouse gas emissions in your community with the averages in the NWT, Canada, the world, and the safe limit. We define the safe limit as 0.5 tonnes of CO_{2EQ} per person per year, based on a world population of 6 billion people.

Small communities usually have lower greenhouse gas emissions than the NWT average because they have less local transport and a smaller commercial sector.

Pine Point Energy Profile 2004 - 2005

Total cost: \$3,370,000
Total energy: 101,000,000 Mega Joules

Diesel - Electricity

* 48% of Cost
* 32% of Greenhouse Gases



29% of Energy

Diesel Generator

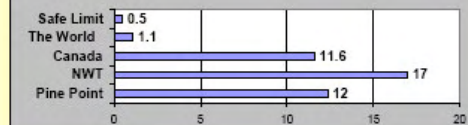
* 68% Waste Heat
* 32% Electricity



Waste Heat

Greenhouse gas emissions
6,690 Tonnes
CO₂ Eq

Greenhouse gases - Tonnes CO₂ Eq per person



Diesel (Heating & Vehicles)

* 31% of Cost
* 49% of Greenhouse Gases



43% of Energy

Gasoline (Vehicles)

* 16% of Cost
* 19% of Greenhouse Gases



18% of Energy

Wood

* 5% of Cost
* 0% of Greenhouse Gases



10% of Energy

45% of Electricity

50% of Diesel

100% of Wood



55% of Electricity

25% of Diesel



100% of Gasoline

25% of Diesel



Five alternative sources of energy

- 1) Solar energy can heat water and buildings, and make electricity
- 2) 'Run-of-river' hydro can make electricity without flooding the land
- 3) Wind energy can produce electricity
- 4) Wood can be a sustainable fuel if we manage the forest well
- 5) Waste heat from diesel generators can heat buildings



Top five ways to use less energy and save money

- 1) Develop everyday habits that save energy
- 2) Buy energy-saving appliances and other products
- 3) Buy a vehicle that uses less energy
- 4) Build energy-saving new buildings
- 5) Renovate older buildings so they use less energy

Create an energy profile poster by hand

You use the data from the energy supplier surveys and make various calculations to create an energy profile poster. You also use a lot of this information in the energy profile report.

Here is a list of the main calculations:

- Convert different fuel measurements to MJ and calculate total MJ.
- Calculate % of total MJ for categories of fuel and end use.
- Calculate fuel costs and % total costs.
- Calculate greenhouse emissions and % greenhouse gas emissions.
- Calculate % electricity and % waste heat from diesel-electricity power plant.
- Calculate the width of the arrows on the poster.

The Toolkit includes worksheets to do all these calculations. You can also set up an Excel spreadsheet and the Toolkit includes instructions to do that.

Note: Round large numbers to three significant digits. For example
 $101,394,625 \text{ MJ} = 101,000,000 \text{ MJ}$

Round smaller numbers to one decimal place. For example
 $4.621 = 4.6$

Convert fuel measurements to mega joules (MJ)

To create the energy profile, you first need to convert all the fuel measurement data from your surveys to the same measurement - mega joules (MJ). You do this so you can add up and directly compare the different fuels, to best understand how and where your community uses energy.

Each community uses several different fuels such as gasoline, diesel, fuel oil, and firewood. And we measure different fuels in different ways. For example, we measure electricity in kilowatt hours, we measure gasoline in litres, and we measure firewood in cords.

Important Fact

This Toolkit uses the metric system's unit to measure energy: the Joule or J.

1000 Joules (J) = 1 mega Joule (MJ)

It takes 400 MJ of energy to heat one litre of water from 5°C to boiling.

Use Worksheet 2-3 to convert the data from your surveys to mega joules. The conversion table below also shows the conversion factor for a variety of different fuel measurements.

Conversion Table To change fuel measurements to Joules (J)

(from "A Guide to Residential Wood Heating", Natural Resources Canada)

1 British Thermal Unit (BTU)	1,055 J
1 kilo joule (KJ)	1,000 J
1 mega joule (MJ)	1,000,000 J
1 amp hour (12 V battery)	43.2 KJ
1 kWh electricity	3.6 MJ
1 litre gasoline	35.0 MJ
1 litre #2 heating oil	38.2 MJ
1 litre diesel	36.4 MJ
1 litre propane	25.3 MJ
1 cubic metre natural gas	37.5 MJ
1 full cord dry hardwood	30,600 MJ
1 full cord dry softwood	25,000 MJ

Worksheet 2-3: Convert Fuel Measurements to MJ

(1 of 3 pages)

- 1) From Worksheet 2-1, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure each fuel as mega joules (MJ).
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total amount of fuel in MJ.
- 4) Use the following guidelines to divide diesel fuel if your survey worksheets combine it: heating – 75%, transport – 25%. Note: diesel – electricity should be separate from heating and transport.

Fuel	Amount	Units	Conversion factor	Total fuel in MJ
Diesel – electricity		Litres	X 36.4	MJ
Natural gas – electricity		M ³	X 37	MJ
Hydro – electricity		KWh	X 3.6	MJ
Wind – electricity		KWh	X 3.6	MJ
Solar – electricity		KWh	X 3.6	MJ
Electricity subtotal				MJ

Worksheet 2-3: Convert Fuel Measurements to MJ (2 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure each fuel as mega joules (MJ).
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total amount of fuel in MJ.

Fuel	Amount	Units	Conversion factor	Total fuel in MJ
Fuel oil or diesel – heating		Litres	X 36.4	MJ
Gas or propane – heating		M ³	X 37	MJ
Solar air/water, waste heat recovery		MJ	1	MJ
Firewood – heating		Cords	X 18,700	MJ
Wood pellets – heating		Tonnes	X 19,800	MJ
Heating subtotal				MJ

Worksheet 2-3: Convert Fuel Measurements to MJ (3 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure each fuel as mega joules (MJ).
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total amount of fuel in MJ.

Fuel	Amount	Units	Conversion factor	Total fuel in MJ
Gasoline – transport		Litres	X 35	MJ
Diesel – transport		Litres	X 36.4	MJ
Transport subtotal				MJ
Grand total (electricity subtotal + heating subtotal + transport subtotal)				MJ

Calculate MJ per person: Total MJ per year ÷ # people in community = Average MJ per person

MJ ÷ = MJ/person

Calculate percent of total energy use

The energy profile shows total energy use in mega joules (MJ) and the percent of energy use for different categories of energy, based on fuel and end use.

Use Worksheet 2-4 to calculate the percent of total energy in different categories of fuel and end use. Use a separate line for each category you used in Worksheet 2-3.

Worksheet 2-4: Calculate % Total MJ

- 1) From Worksheet 2-3, fill in columns 1 and 2: Categories and MJ for each category.
- 2) From Worksheet 2-3, fill in column 3: Grand total MJ - the same number for each row.
- 3) Calculate the % total energy for each category. Divide column 2 by column 3 and multiply by 100. Example: Total MJ for diesel electricity = 28,928,354. Grand total MJ = 101,394,625. % total energy = $28,928,354 \div 101,394,625 \times 100 = 29\%$

Categories fuel type / end use	MJ for each category	Total MJ	% Total energy
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
Totals	MJ	MJ	%

Calculate Energy Costs

The energy profile shows total energy costs and percent of total costs for different energy categories.

Use Worksheet 2-5 to calculate total energy costs.

Use Worksheet 2-6 to calculate percent of total costs for different energy categories. Use the same categories you used for percent of total mega joules.

Worksheet 2-5: Calculate Fuel Costs

(1 of 3 pages)

- 1) From your survey sheets, enter the total cost for each type of fuel on the appropriate line.
- 2) From worksheet 2-3, enter the total MJ for each type of fuel.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total cost of fuel energy.
- 4) Divide the total cost by the total MJ to calculate the cost per MJ.

Fuel	Total cost	Total MJ	Cost per MJ
Diesel – electricity	\$	MJ	\$ per MJ
Natural gas – electricity	\$	MJ	\$ per MJ
Hydro – electricity	\$	MJ	\$ per MJ
Wind – electricity	\$	MJ	\$ per MJ
Solar – electricity	\$	MJ	\$ per MJ
Electricity subtotals	\$	MJ	\$ per MJ

Worksheet 2-5: Calculate Fuel Costs (2 of 3 pages)

- 1) From your survey sheets, enter the total cost for each type of fuel on the appropriate line.
- 2) From worksheet 2-3, enter the total MJ for each type of fuel.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total cost of fuel energy.
- 4) Divide the total cost by the total MJ to calculate the cost per MJ.

Fuel	Total cost	Total MJ	Cost per MJ
Fuel oil or diesel – heating	\$	MJ	\$ per MJ
Gas or propane – heating	\$	MJ	\$ per MJ
Firewood – heating	\$	MJ	\$ per MJ
Wood pellets – heating	\$	MJ	\$ per MJ
Solar air or water - heating	\$	MJ	\$ per MJ
Waste heat recovery	\$	MJ	\$ per MJ
Heating subtotals	\$	MJ	\$ per MJ

Worksheet 2-5: Calculate Fuel Costs (3 of 3 pages)

- 1) From your survey sheets, enter the total cost for each type of fuel on the appropriate line.
- 2) From worksheet 2-3, enter the total MJ for each type of fuel.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total cost of fuel.
- 4) Divide the total cost by the total MJ to calculate the cost per MJ.

Fuel	Total cost	Total MJ	Cost per MJ
Gasoline – transport	\$	MJ	\$ per MJ
Diesel – transport	\$	MJ	\$ per MJ
Transport subtotals	\$	MJ	\$ per MJ
Grand totals Electricity + heating + transport	\$	MJ	\$ per MJ

Worksheet 2-6: Calculate % Total Cost

- 1) From Worksheet 2-5, fill in columns 1 and 2: Categories and Cost for each category.
- 2) From Worksheet 2-5, fill in column 3: Grand total cost - the same number for each row.
- 3) Calculate the % total cost for each category. Divide column 2 by column 3 and multiply by 100. Example: Total cost for diesel electricity = \$1,633,813. Grand total cost = \$3,369,777. % Total cost = $\$1,633,813 \div \$3,369,777 \times 100 = 48\%$

Categories fuel type - end use	Cost for category	Total Cost	% Total cost
	\$	\$	%
	\$	\$	%
	\$	\$	%
	\$	\$	%
	\$	\$	%
	\$	\$	%
Totals	\$	\$	%

Calculate Greenhouse Gas Emissions

The energy profile shows greenhouse gas emissions as kilograms of carbon dioxide equivalent (kg CO₂ EQ). Carbon dioxide is the most common greenhouse gas and we use it to show overall greenhouse gas emissions.

Energy Fact

A large pickup truck that uses 80 litres of gasoline per week produces 10 Tonnes of CO₂ EQ per year – enough to fill 10 two-storey, three-bedroom houses.

Each fuel has a standard formula to calculate greenhouse gases as kg of CO₂ EQ. We use this formula to calculate greenhouse gases for each fuel or energy.

Use Worksheet 2-7 to calculate greenhouse gas emissions as kg of CO₂ EQ.

Use Worksheet 2-8 to calculate the percent of greenhouse gas emissions from each category of energy. Use the same categories you used to calculate the percent of total mega joules and the percent of total cost.

Energy Fact

The energy profile shows that wood has no greenhouse gas emissions. Trees absorb carbon dioxide when they grow. This balances the greenhouse gases that wood produces when it burns.

Worksheet 2-7: Calculate Greenhouse Gas Emissions

(1 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure greenhouse gas emissions for each fuel. We use kilograms of carbon dioxide equivalent as the standard measure.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the grand total at the end.

Fuel	Amount	Units	Conversion factor	Total Kg CO ₂ EQ
Diesel – electricity		Litres	X 2.73	Kg CO ₂ EQ
Natural gas – electricity		M ³	X 1.89	Kg CO ₂ EQ
Hydro – electricity		KWh	X 0	Kg CO ₂ EQ
Wind – electricity		KWh	X 0	Kg CO ₂ EQ
Solar – electricity		KWh	X 0	Kg CO ₂ EQ
Electricity subtotal				kg CO₂EQ

Worksheet 2-7: Calculate Greenhouse Gas Emissions (2 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure greenhouse gas emissions for each fuel. We use kilograms of carbon dioxide equivalent as the standard measure.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the grand total at the end.

Fuel	Amount	Units	Conversion factor	Total Kg CO ₂ EQ
Fuel oil or diesel – heating		Litres	X 2.73	Kg CO ₂ EQ
Gas – heating		M ³	X 1.89	Kg CO ₂ EQ
Propane		M ³	X 1.5	Kg CO ₂ EQ
Solar air/water, waste heat recovery		MJ	0	Kg CO ₂ EQ
Firewood & wood pellets			0	Kg CO ₂ EQ
Heating subtotal				Kg CO₂EQ

Worksheet 2-7: Calculate Greenhouse Gas Emissions (3 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure greenhouse gas emissions for each fuel. We use kilograms of carbon dioxide equivalent as the standard measure.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the grand total at the end.

Fuel	Amount	Units	Conversion factor	Total Kg CO ₂ EQ
Gasoline – transport		Litres	X 2.36	Kg CO ₂ EQ
Diesel – transport		Litres	X 2.73	Kg CO ₂ EQ
Transport subtotal				Kg CO₂EQ
Grand total (electricity subtotal + heating subtotal + transport subtotal)				Kg CO₂EQ

Kg CO₂EQ per person: Grand total Kg CO₂EQ ÷ # people in community = Average Kg CO₂EQ per person

Kg CO₂EQ ÷ = Kg CO₂EQ/person

Worksheet 2-8: Calculate % Total Greenhouse Gas Emissions

- 1) From Worksheet 2-7, fill in columns 1 and 2: Categories and kg CO₂EQ per category.
- 2) From Worksheet 2-7, fill in column 3: Total kg CO₂EQ – the same number for each row.
- 3) Calculate the % total kg CO₂EQ for each category. Divide column 2 by column 3 and multiply by 100. Example: Total kg CO₂EQ = 6,686,750. Total kg CO₂EQ for diesel - electricity = 2,169,627.
 $\% \text{ Total kg CO}_2\text{EQ} = 2,169,627 \div 6,686,750 \times 100 = 32\%$

Categories: fuel type - end use	kg CO ₂ EQ per category	Total kg CO ₂ EQ	% kg CO ₂ EQ
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
Totals	kg CO₂EQ	kg CO₂EQ	%

Worksheet 2-9: Calculate % Electricity and % Waste Heat from a Power Plant

Use this worksheet if your community has a diesel or natural gas power plant.

- 1) From Worksheet 2-3, fill in column 1: Total MJ electricity from power plant.
- 2) From Worksheet 2-3 fill in column 2: Total MJ diesel for electricity.
- 3) Calculate % Electricity: Divide column 1 by column 2 and multiply by 100. Example: Total MJ electricity from power plant = 9,189,288. Total MJ diesel for electricity = 28,928,354. $\% \text{ Electricity} = 9,189,288 \div 28,928,354 \times 100 = 32\%$
- 4) Calculate % Waste heat: Subtract % Electricity from 100%. Example: Electricity = 32%. $\% \text{ Waste heat} = 100\% - 32\% = 68\%$.

Total MJ Electricity from Power Plant	Total MJ Diesel for electricity	% Electricity	% Waste heat

Calculate by hand the width of the arrows for the energy profile poster

The energy profile poster has two sets of arrows. See a sample poster on page 26 in this section or in Appendix 2-B.

The left arrows show the percent of total MJ for each category of energy going into your community. The right arrows show the percent of each category that your community uses for homes, for other buildings in the community, and for transport.

Other arrows show the percent of total MJ of electricity and the percent of total MJ of waste heat from the diesel power plant.

The width of the arrows represents the percent of the total. Use Worksheet 2-10 to calculate by hand how wide to make the arrows.

Round off all your calculations to one decimal place. For example 1.18 inches = 1.2 inches.

Worksheet 2-10: Calculate the width of the arrows

(1 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width = 4 inches.

Left hand (LH) arrows

- Fill in Columns 1 and 2 from Worksheet 2-4. Use the same categories.
- To calculate Column 3: LH arrow width - Multiply % Total MJ by 4 inches. Example: Diesel-electricity = 29% of total MJ. $29\% \times 4 \text{ inches} = 1.2 \text{ inches}$. The LH arrow for diesel-electricity is 1.2 inches thick.

Category: fuel – end use	% Total MJ	LH arrow width

Worksheet 2-10: Calculate the width of the arrows (2 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width = 4 inches.

Waste heat and electricity arrows

- From Worksheet 2-8 fill in Row 1: % waste heat and % electricity.
- From page 1 of this worksheet, fill in Row 2: Width LH arrow for diesel-electricity – the same number across the row.
- To get the width of the waste heat arrow, multiply the width of the LH arrow by the % waste heat. Example: % waste heat = 68%. LH diesel-electricity arrow = 1.2 inches. Waste heat arrow = $68\% \times 1.2 \text{ inches} = .8 \text{ inches}$.
- To get the width of the electricity arrow, multiply the width of the LH arrow by the % electricity. Example: % electricity = 32%. LH diesel-electricity arrow = 1.2 inches. Electricity arrow = $32\% \times 1.2 \text{ inches} = .4 \text{ inches}$.

	Waste heat	Electricity
1) % Diesel for electricity	%	%
2) Width LH Diesel for electricity arrow		
3) Width waste heat and electricity arrows		

Worksheet 2-10: Calculate the width of the arrows (3 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width of arrows = 4 inches.

Right hand (RH) arrows - Electricity

- Use Worksheet 2-1: Survey Energy Suppliers, to fill in Rows 1 and 2. Divide Row 2 by Row 1 and multiply by 100 to get Row 3: % Electricity.
- Fill in Row 3 with 45% homes and 55% other buildings if the surveys don't have the information you need.
- Use number from page 2 of this worksheet to fill in Row 4 – the same number across the row.
- To get Row 5 multiply the percent in Row 3 by the number in Row 4. Example: % electricity homes = 45%. Electricity arrow = .4 inches. RH arrow = $.4 \times 45\% = .2$ inches.

Electricity	Homes	Other buildings
1) MJ electricity used		
2) Total MJ electricity		
3) % Electricity		
4) Width electricity arrow		
5) Width RH arrow		

Worksheet 2-10: Calculate the width of the arrows (4 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width of arrows = 4 inches.

Right hand arrows – Diesel for heating and transport

- Use Worksheet 2-1 to fill in Rows 1 and 2. Divide Row 2 by Row 1 and multiply by 100 to get the % Diesel – Row 3.
- Fill in Row 3 with 25% homes, 25% other buildings, 50% transport if the surveys lack the information you need.
- Use numbers from page 1 of this worksheet to fill in Row 4.
- To get the width of the RH arrow, multiply the number in Row 3 by the number in Row 4.

Diesel or fuel oil	Homes	Other buildings	Transport
1) MJ diesel used			
2) Total MJ diesel			
3) % Diesel			
4) Width LH diesel arrow			
5) Width RH arrow			

Worksheet 2-10: Calculate the width of the arrows

(5 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width of arrows = 4 inches.

Right hand arrows – Wood and Gasoline

- Assume 100% wood goes to homes, unless you have different, more detailed information about your community. The RH wood arrow is the same width as the LH wood arrow. See page 1 of this worksheet.
 - Assume 100% of gasoline goes to transport. The RH gasoline arrow is the same width as the LH gasoline arrow. See page 1 of this worksheet.
-

How to use an Excel spreadsheet to create an energy profile poster

You need to understand Excel and how it works to use this spreadsheet. Call the Arctic Energy Alliance if you need help. Toll free 1-877-755-5855.

To begin, you enter data from the energy supplier surveys and the Excel spreadsheet automatically does the following:

- Converts different fuel measurements to MJ.
- Calculates total MJ and % of total for different categories of fuel and end use.
- Calculates total cost and % total cost.
- Calculates total greenhouse gas emissions and % from different categories of fuel and end use.
- Calculates % electricity and % waste heat from diesel-electric generator.

Open the spreadsheet file – get to know it

Find the spreadsheet file on the CD that comes with this Toolkit - an Excel file called '**Energy Profile poster Excel spreadsheet**'. Load it on your computer and open it.

Look at all the formulas and make sure you know how the spreadsheet works before you use it. The math and formulas are not complicated. Once you understand how they work you can change them if needed. **Do not type over the formulas** unless you want to change how the spreadsheet works.

Enter data in the spreadsheet

With the Excel file open, click on 'Baseline year' tab to enter data. You enter data in the **yellow cells ONLY**. The other cells contain constants and formulas that are the same for each community. **Do not type over the formulas**, unless you want to change how the spreadsheet works.

We assume you've already used Worksheet 2-1 to collect data from all the energy suppliers in your community.

1. **From the energy supplier surveys**, enter the amount of fuel in Column C - **yellow cells**. Be sure the units on the survey match the units on the spreadsheet.

Note: Include local data you have about wood heat, with the assumptions you made.

2. **From the energy supplier surveys**, enter the cost per unit in Column M – **yellow cells**.

Note: For electricity the spreadsheet uses total cost for each fuel type because you can more easily get this information from the electric utility.

Note: For heating and transportation fuels we use the price per unit – litre, cord – because you usually can't get total cost information.

Note: Choose one price for each fuel in your baseline year and use that same price for all calculations.

3. **From the energy supplier survey, page 2**, enter the electricity breakdown data in the 'Electrical Demand Data' section – **yellow cells**.

4. **Add one or more rows if you need to add different kinds of fuel.** Make sure you copy all the formulas correctly.
5. **Fill in the population** of your community - the **yellow cell C24**.
6. **Write the name of your community in two places** – B54 and B65 **yellow cells**. Click on the cell and write your community's name to replace the words 'your community'.
7. **Update the notes at the bottom** of the spreadsheet as you enter data. Make notes about where you got your information and what assumptions you made, if any.

Update the poster

In the Excel file, click on the 'Energy Poster' tab. The text and numbers on the energy poster do not automatically update. You have to do this by hand. Each box with numbers and text is a text box.

As you enter numbers on the poster, round off large numbers to three significant digits. For example, 282,712 litres = 282,000 litres. Look below to find the cell in the spreadsheet to find the numbers for each text box.

1. In the '**Energy Profile**' text box, top left corner, write the name of your community before the words 'energy profile' and the year of your study after.
2. Update the '**Total cost Total energy**' text box:

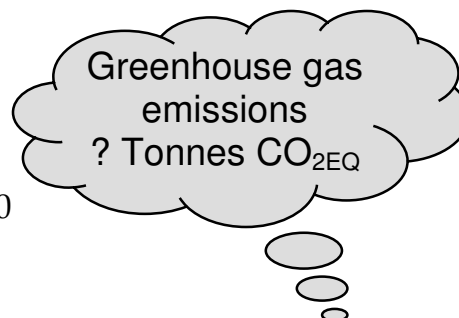
Total cost: \$	
Total energy:	mega joules

Total cost: cell N23, baseline year Excel spreadsheet.





Total energy: cell F23, baseline year Excel spreadsheet.

3. Update the '**Greenhouse gas emissions**' text box. Replace the ? with a number from your spreadsheet.

- Find **kilograms CO_{2EQ}**: cell R23, baseline year Excel spreadsheet.
- **Convert kilograms to Tonnes**: divide by 1000. For example 5,000 kilograms = 5 Tonnes.

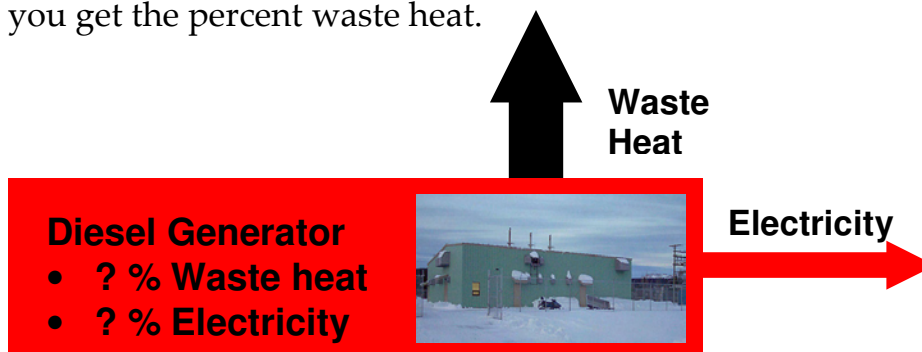


4. Update the text box for each **fuel type**. Make sure you have one box for each - add or remove text boxes as needed. Replace the ? with numbers from your spreadsheet.
 - Find % **cost**: Column O, baseline year Excel spreadsheet.
 - Find % **greenhouse gases**: Column T, baseline year Excel spreadsheet.
 - Find % **energy**: Column H, baseline year Excel spreadsheet.

<p>Diesel - Elec</p> <p>* ? % of Cost</p> <p>* ? % of Greenhouse Gases</p>		<p>? % of Energy</p>
<p>Gasoline</p> <p>* ? % of Cost</p> <p>* ? % of Greenhouse Gases</p>		<p>? % of Energy</p>
<p>Fuel Oil & Die</p> <p>* ? % of Cost</p> <p>* ? % of Greenhouse</p>		<p>? % of Energy</p>
<p>Wood</p> <p>* ? % of Cost</p> <p>* ? % of Greenhouse Gases</p>		<p>? % of Energy</p>

5. Update the information in the **Diesel Generator** box:

- Find % **Electricity**: cell F39, baseline year Excel spreadsheet.
- Find % **Waste heat**: subtract the number in cell F39 and you get the percent waste heat.



If your community doesn't have a diesel generator, remove this box from the poster.

6. **Add a photo of your community** in the middle of the poster. To get the photo behind the diesel power plant box right click the picture, click 'order', and then click 'send to back'.
7. Change the **photos of homes, other buildings, and / or transport** to local photos if you want. Or just leave what is already there.
8. Check the greenhouse gas emissions graph – top right corner. This graph is linked directly to data in rows 53 to 58 on the spreadsheet and it should automatically update. Check to see if the results there make sense.

9. **Set the width of the arrows by hand. They don't automatically set themselves from the spreadsheet.**

To update the arrow width, right click on the arrow you want to change, then click 'Format Autoshape'. Change the 'weight' to the same number as the '% of total energy' in column H. The Excel spreadsheet, baseline year, has information to calculate % total energy for different arrows.

You may be able to take information directly from the spreadsheet to use as weight for each arrow. OR you may have to use more than one number from the spreadsheet and do further calculations to get the information you need.

- **Fuel supply arrows – left side:** Use the numbers in the 'Energy Source Input' section.
- **Diesel generator arrows - Waste Heat and Electricity:** Use the numbers in the 'Diesel Generator Analysis' section.
Find % **Waste heat**: cell H38 for arrow width.
Find % **Electricity**: cell H37 for arrow width.
- **Electricity arrows – right side:** Use the numbers in the 'Electrical Demand' section.
- **Transportation arrows – right side:** Use the diesel and gasoline vehicle numbers in the 'Energy Source Input Data' section. The gasoline arrow should be the same width on the left and the right. We assume transport uses 100% gasoline fuel.

If your data combines diesel for transport with diesel or heating oil, use the following breakdown: 25% for

transport, 50% for home heating, and 25% to heat other buildings. Note this assumption on the poster.

- **Fuel oil or diesel heating arrows – right side:** Use the numbers in the 'Energy Source Input Data' section.

If your data combines heating oil with diesel for transport, use the following breakdown: 25% for transport, 50% for home heating, and 25% to heat other buildings. Note this assumption on the poster.

- **Wood heating arrows – left and right sides:** Use the numbers in the 'Energy Source Input Data' section. Assume that homes burn all the wood. The wood arrow is the same width on the left and the right.

10. Check the poster. Use 'print preview' in the file menu to make sure things look good. Check the numbers to make sure they're accurate. Do they make sense?

Print your poster and get ready to create the energy profile report.

Create a community energy profile report

The Toolkit includes a report template. See Appendix C at the end of Step 2 for a copy of the template. The template file is on the CD that comes with this Toolkit – it's called '**Community Energy Profile Report template**'. Open the file and download it to your computer. Use the template to create your community energy profile report. If you don't have a computer, you can photocopy the template in the Toolkit and fill things in by hand.

Overview of the energy profile report template

The energy profile report template is about 40 pages long and it has the following sections in the Table of Contents:

- Introduction and Acknowledgements
- What is a community energy profile?
- Why create a community energy profile?
- How does an energy profile measure energy?
- How does the energy profile measure greenhouse gas emissions?
- Community energy profile poster
- Community energy profile summary
- How much energy does our community use?
- How much does our energy cost?
- How much greenhouse gas emissions does our community produce?
- Where does our community use energy?

- Five alternative sources of energy
- Five ways to use less energy

The energy profile report includes some information that is the same for all communities. It also has many places to include information specific to your community.

Add your community's data and information to the energy profile report template

Here is a list of places to add the information specific to your community, in the order they appear in the template. The information mostly comes from the Excel spreadsheet or from the calculations you did on the worksheets that come with Step 2.

i) **Cover page**

Write the name of your community and the study year on the cover page, under the title 'Community Energy Profile Report'.

ii) **Introduction and Acknowledgements page**

At the top of the page complete the statement that starts with 'Our community ...' Include the year the council made a resolution, formed an energy planning committee, and began the planning process.

Write down the names of individuals, businesses, agencies, funders, and other people you want to thank.

Write down who people in your community can contact to get more information.

iii) Page 8

Insert a copy of your energy profile poster.

iv) Page 9

Complete the table. Use the energy supplier surveys to list the fuels your community uses and the sources of information for each fuel.

v) Page 10

Complete the chart. Double-click on the chart and open the datasheet. Change the fuel categories if you need to. Fill in the datasheet with % total energy, % total cost, and % total greenhouse gases in the appropriate column. Be sure to include the % sign on the datasheet. In the template, each fuel category is set at 5%.

vi) Pages 11, 12, and 13

These tables give the details about energy use, energy costs, and greenhouse gas emissions. Use the same categories of fuel and end use that you used on the poster.

vii) Page 14

The chart on page 14 compares greenhouse gas emissions from your community with national and international emissions. Double-click on the chart and enter the Tonnes CO₂EQ per person greenhouse gas emissions in your community.

viii) Page 15

Fill in the table on page 15. Change the categories of fuel and end use if you need to – make them the same as the categories you used on the poster, and in the worksheets or the Excel spreadsheet.

Alternative sources of energy and energy efficiency

The rest of the energy profile report talks about alternative sources of energy and energy efficiency. When people decide to use energy more wisely, they can choose one of two main ways to change things:

- i) Change where energy comes from - replace imported, non-renewable sources of energy with local, renewable sources.
- ii) Change how you use energy - use energy more efficiently – use less energy and save money.

The Community Energy Profile report gives some good basic information about five alternative sources of energy and the top five ways to use less energy and save money. This information builds on the list of things at the bottom of the energy profile poster.

Most of this part of the energy profile report is the same for all communities. One alternative source of energy the report discusses is wind turbines. You can create a wind map for your community and insert it in the report to show people the overall potential for wind energy as a potential option.

Create a wind map for the energy profile report

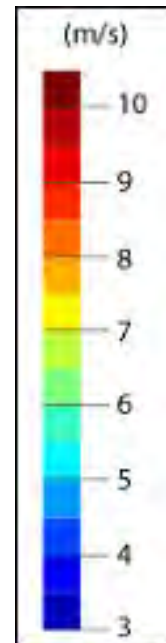
Follow these 10 steps to create a wind map of your community for the energy profile report. Insert the wind map on page 31 - replace the map that's already there. We left a sample map there so you could see what it looks like.

- i) Go to www.windatlas.ca
- ii) Click 'Maps'.
- iii) Click on the area of the map where your community is located. On the left of the screen, select all the following:
 - Mean Wind Speed
 - 50 metres
 - Power Lines
 - Lakes & Rivers
 - Roads
 - Cities
- iv) Click on 'Printing' at the bottom left hand corner of the screen.
- v) Save the map to your computer. Right click on the image and select 'Save As'.
- vi) Open the map in Photoshop or another image program.
- vii) Resize the map so it fits nicely on the page in the energy profile report - about 14cm x 14cm (400 x 400 pixels OR 5.5 inches x 5.5 inches). You may need to combine a few map

squares to get the best map of your community and surrounding area.

- viii) Add a larger dot with your community's name to the map. Add text to the map that says : 'Wind Speed – Metres per Second at 50 metres above the ground' and 'www.windatlas.ca'.

- ix) Copy and paste this wind speed legend graphic into the picture.
- x) Save the new map as a *.jpg file and then insert it into your energy profile report document, page 31.



How to use the energy profile poster and report

Use the Community Energy Profile to show people why they need to take action. Help people recognize and understand the economic, environmental, and social benefits of the community energy planning process. Encourage people to take action to help make your community and the world a healthier place for us all.

Present the Community Energy Profile at a community meeting and use the meeting to begin Step 4 of the community energy planning process. Share your successes with other communities and encourage them to take action too.

Appendix 2-A: Step 2 Worksheets

The Toolkit provides these worksheets for Step 2. Also find them on the CD that comes with the Toolkit.

- Sample letter to energy supplier
- Worksheet 2-1: Survey fuel suppliers
- Sample letter survey household energy use
- Worksheet 2-2: Survey household energy use
- Conversion table fuel measurements to MJ
- Worksheet 2-3: Convert fuel measurements to MJ
- Worksheet 2-4: Calculate % total MJ
- Worksheet 2-5: Calculate Fuel Costs
- Worksheet 2-6: Calculate % total fuel costs
- Worksheet 2-7: Calculate greenhouse gas emissions
- Worksheet 2-8: Calculate % total greenhouse gas emissions
- Worksheet 2-9: Calculate % electricity, % heat in power plant
- Worksheet 2-10: Calculate by hand width of arrows on energy profile poster

Sample letter to energy supplier

Energy supplier's name and address

Your name and address, unless you use letterhead

November 14, 2006

Dear Sir or Madam,

Our community is working to create a community energy plan and we need your help. A community energy plan shows what action we plan to take in the future to use energy more wisely. To develop a plan that best suits the needs of our community, we first need to understand how we use energy right now – we need to create an energy profile.

To gather data for the energy profile, we're asking each energy supplier in our community to fill out a form, to tell us how much fuel our community used in a year and how much it cost. Our study is for the year April 2005 to March 2006.

Please fill out the attached form and return it to us by December 7, 2006. If you have questions, please call us at 867-123-4567.

Thanks for taking the time to participate in this important work. We believe our whole community will benefit from a community energy plan.

Sincerely,

Worksheet 2-1: Survey Community Fuel Suppliers

(1 of 2 pages)

Use this worksheet to gather data about how much fuel your community uses in a year.

- Use a separate sheet for each fuel supplier.
- Choose a particular year to study – the most recent year for which you can get all the relevant information.
- Fill out page 2 of the survey for a breakdown of electricity.

Community:

Year:

Fuel supplier: (gas station, power plant, firewood cutter, etc.)

Contact person:

Phone #:

Type of fuel: (diesel, gasoline, wood, heating oil, etc.)

Fuel end use: (electricity, heating, transport, etc.)

Yearly amount: (clearly note units such as litres, cords, kWh, etc.)

Yearly cost:

Worksheet 2-1: Survey Community Fuel Suppliers

(2 of 2 pages)

Electricity breakdown – electric utility only

To the electric utility: Please give a breakdown of how many kilowatt hours (kWh) produced for residential, general, and streetlights, and the cost for each one.

	Yearly cost	kiloWatt hours
Residential	\$	KWh
General	\$	KWh
Streetlights	\$	KWh
Total	\$	KWh

Total yearly cost ÷ Total kWh = Average cost per kWh

\$ ÷ kWh = \$

Comments:

Sample letter – Survey household energy use

Community Energy Planning Committee
Community name

November 14, 2006

To all the homes in our community,

Our community is working to create a community energy plan and we need your help. A community energy plan shows what action we plan to take in the future to use energy more wisely.

To create an energy plan that best suits the needs of our community, we need to understand how we use energy right now. We need to create an energy profile.

To create the profile we're asking each home to fill out a confidential survey about your energy use. We'll add up the information from all the surveys to find out how much fuel our community used in a year and how much it costs. Our study is for the year April 2005 to March 2006.

Please fill out the attached form and return it to us by December 7, 2006. If you have questions about the form or about energy planning in our community, please call us at 867-123-4567.

Thanks for sharing information and your ideas. Our community energy plan will help us use less energy and save money, and our whole community will benefit.

Sincerely,

Worksheet 2-2: Survey household energy use

ID Information

Community:

Date:

First and last name:

Number of people living in the home, including children:

Signature:

Energy issues in your community

Rank the top three energy issues in our community – 1, 2, 3.

Energy costs	
Greenhouse gas emissions and climate change	
Local jobs	
Local environmental impacts – eg. noise or pollution	
Local versus outside ownership	
Local versus imported sources of energy	
Leadership in technical development	
Other – please describe	

Energy issues in your community

What actions do you think our community could take to use energy more wisely? Name one or two ideas you have.

Do you think climate change makes your environment different? If yes, please give one or two examples of how things are different.

Energy consumption in your home**Who owns your home?**

- ☐ Yourself or another local person or business
- ☐ Local housing authority or other government agency
- ☐ Other _____

Does someone subsidize your energy bills?

- ☐ Yes
- ☐ No
- ☐ Don't know

Check each type kind of energy you use and estimate how much money you spend in a year:

Fuel	Total cost	Use/year	Price/unit
<input type="checkbox"/> Oil	\$	litres	\$ /litre
<input type="checkbox"/> Electricity	\$	kWh	\$ /kWh
<input type="checkbox"/> Natural gas/Propane	\$	litres	\$ /litre
<input type="checkbox"/> Firewood	\$	cords	\$ /cord
<input type="checkbox"/> Other _____	\$		\$

Do you turn down the heat at night or when you're not home?

- ☐ Yes
- ☐ No
- ☐ Don't know

Tip: If you turn down the heat at night you save money and energy. Get a thermostat that automatically turns down the heat and turns it up in the morning before you get out of bed.

Energy consumption in your home

What kind of stove do you cook on? Check all that apply.

- ☐ Electric
- ☐ Gas or propane
- ☐ Microwave
- ☐ Other _____

Tip: Cooking with propane costs less than cooking with electricity. Microwaves use less electricity than electric stoves.

What kind of hot water heater do you have?

- ☐ Electric
- ☐ Gas or propane
- ☐ Oil
- ☐ Other _____

Tip: Depending on where you live, oil fired hot water heaters may be cheaper to operate than electric hot water heaters.

How old is your hot water heater? _____ years

Tip: Water heaters usually last about 10 years. When it's that old, get a new, energy efficient water heater.

What temperature do you set your water heater at? _____ °C

°Fahrenheit	32	50	68	86	104	122	140	158	176	194	212
°Celsius	0	10	20	30	40	50	60	70	80	90	100

Tip: Set your water heater at 49°C (120 °F) – high enough to kill germs. If you set it higher you waste energy and people might get burned.

Energy consumption in your home

Do you have an insulation blanket on the outside of your hot water heater?

- ☐ Yes
☐ No

Do you have insulation on your hot water pipes?

- ☐ Yes
☐ No

Tip: Insulation helps keep the heat in your water heater and pipes, and you pay less for hot water.

How many light bulbs do you have in your house? _____

How many are compact fluorescent bulbs? _____

Tip: You save energy and money if you use compact fluorescent bulbs. They use $\frac{1}{4}$ of the energy and produce the same light.

Do you have an Energy Star washing machine?

- ☐ Yes
☐ No

Tip: ENERGY STAR is a symbol for products that use less energy – ovens, fridges, freezers, stoves, dishwashers, computers, and TVs.



What other Energy Star products do you have in your home?

Energy consumption transportation**Do you own a car or truck?**

- ☐ Yes
☐ No

If yes, please give the following details for each vehicle.

Vehicle 1**Vehicle 2**

Make:

Model:

Year:

Type of fuel:

km you drive in a year:

Fuel use per year:

Fuel cost per year:

Do you have a timer on your engine block heater?

- ☐ Yes
☐ No

Tip: Save energy and money. Use a timer to automatically turn on the block heater - plug in your vehicle only when you need to. When it's colder than -20 °C set the block heater to go on for two hours before you need to drive.

How many minutes do you idle your vehicle on a winter day?

Tip: Idling for over 10 seconds uses more fuel than restarting your engine. Idling pollutes the air with carbon dioxide, which contributes to climate change. Idling wastes gas and money.

Energy consumption transportation**Do you own a snow machine, motorboat, or ATV?**☐ Yes☐ No

If yes, please give the following details for each:

**Snow
machine****Motor
boat****ATV**

Make:

Model:

Year:

2-stroke or 4-stroke:

km you drive in a year:

Fuel use per year:

Fuel cost per year:

Tip: 4-stroke motors save money. They use less fuel, create less exhaust, and are quieter and more reliable than 2-stroke motors.

Thanks for completing the community energy survey.

For more information about community energy planning, contact your energy coordinator or your community energy planning committee at _____.

**Conversion Table
to change fuel measurements to Joules (J)**

(from “A Guide to Residential Wood Heating”, Natural Resources Canada)

1 British Thermal Unit (BTU)	1,055 J
1 kilo joule (KJ)	1,000 J
1 mega joule (MJ)	1,000,000 J
1 amp hour (12 V battery)	43.2 KJ
1 kWh electricity	3.6 MJ
1 litre gasoline	35.0 MJ
1 litre #2 heating oil	38.2 MJ
1 litre diesel	36.4 MJ
1 litre propane	25.3 MJ
1 cubic metre natural gas	37.5 MJ
1 full cord dry hardwood	30,600 MJ
1 full cord dry softwood	25,000 MJ

Worksheet 2-3: Convert Fuel Measurements to MJ (1 of 3 pages)

- 1) From Worksheet 2-1, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure each fuel as mega joules (MJ).
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total amount of fuel in MJ.
- 4) Use the following guidelines to divide diesel fuel if your survey worksheets combine it: heating – 75%, transport – 25%. Note: diesel – electricity should be separate from heating and transport.

Fuel	Amount	Units	Conversion factor	Total fuel in MJ
Diesel – electricity		Litres	X 36.4	MJ
Natural gas – electricity		M ³	X 37	MJ
Hydro – electricity		KWh	X 3.6	MJ
Wind – electricity		KWh	X 3.6	MJ
Solar – electricity		KWh	X 3.6	MJ
Electricity subtotal				MJ

Worksheet 2-3: Convert Fuel Measurements to MJ (2 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure each fuel as mega joules (MJ).
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total amount of fuel in MJ.

Fuel	Amount	Units	Conversion factor	Total fuel in MJ
Fuel oil or diesel – heating		Litres	X 36.4	MJ
Gas or propane – heating		M ³	X 37	MJ
Solar air/water, waste heat recovery		MJ	1	MJ
Firewood – heating		Cords	X 18,700	MJ
Wood pellets – heating		Tonnes	X 19,800	MJ
Heating subtotal				MJ

Worksheet 2-3: Convert Fuel Measurements to MJ (3 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure each fuel as mega joules (MJ).
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total amount of fuel in MJ.

Fuel	Amount	Units	Conversion factor	Total fuel in MJ
Gasoline – transport		Litres	X 35	MJ
Diesel – transport		Litres	X 36.4	MJ
Transport subtotal				MJ
Grand total (electricity subtotal + heating subtotal + transport subtotal)				MJ

Calculate MJ per person: Total MJ per year ÷ # people in community = Average MJ per person

MJ ÷ = MJ/person

Worksheet 2-4: Calculate % Total MJ

- 1) From Worksheet 2-3, fill in column 1 and 2: Categories and MJ for each category.
- 2) From Worksheet 2-3, fill in column 3: Grand total MJ - the same number for each row.
- 3) Calculate the % total energy for each category. Divide column 2 by column 3 and multiply by 100. Example: Total MJ for diesel electricity = 28,928,354. Grand total MJ = 101,394,625. % total energy = $28,928,354 \div 101,394,625 \times 100 = 29\%$

Categories fuel type / end use	MJ for each category	Total MJ	% Total energy
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
	MJ	MJ	%
Totals	MJ	MJ	%

Worksheet 2-5: Calculate Fuel Costs

(1 of 3 pages)

- 1) From your survey sheets, enter the total cost for each type of fuel on the appropriate line.
- 2) From worksheet 2-3, enter the total MJ for each type of fuel.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total cost of fuel energy.
- 4) Divide the total cost by the total MJ to calculate the cost per MJ.

Fuel	Total cost	Total MJ	Cost per MJ
Diesel – electricity	\$	MJ	\$ per MJ
Natural gas – electricity	\$	MJ	\$ per MJ
Hydro – electricity	\$	MJ	\$ per MJ
Wind – electricity	\$	MJ	\$ per MJ
Solar – electricity	\$	MJ	\$ per MJ
Electricity subtotals	\$	MJ	\$ per MJ

Worksheet 2-5: Calculate Fuel Costs (2 of 3 pages)

- 1) From your survey sheets, enter the total cost for each type of fuel on the appropriate line.
- 2) From worksheet 2-3, enter the total MJ for each type of fuel.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total cost of fuel energy.
- 4) Divide the total cost by the total MJ to calculate the cost per MJ.

Fuel	Total cost	Total MJ	Cost per MJ
Fuel oil or diesel – heating	\$	MJ	\$ per MJ
Gas or propane – heating	\$	MJ	\$ per MJ
Firewood – heating	\$	MJ	\$ per MJ
Wood pellets – heating	\$	MJ	\$ per MJ
Solar air or water - heating	\$	MJ	\$ per MJ
Waste heat recovery	\$	MJ	\$ per MJ
Heating subtotals	\$	MJ	\$ per MJ

Worksheet 2-5: Calculate Fuel Costs (3 of 3 pages)

- 1) From your survey sheets, enter the total cost for each type of fuel on the appropriate line.
- 2) From worksheet 2-3, enter the total MJ for each type of fuel.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the total cost of fuel.
- 4) Divide the total cost by the total MJ to calculate the cost per MJ.

Fuel	Total cost	Total MJ	Cost per MJ
Gasoline – transport	\$	MJ	\$ per MJ
Diesel – transport	\$	MJ	\$ per MJ
Transport subtotals	\$	MJ	\$ per MJ
Grand totals Electricity + heating + transport	\$	MJ	\$ per MJ

Worksheet 2-6: Calculate % Total Cost

- 1) From Worksheet 2-5, fill in columns 1 and 2: Categories and Cost for each category.
- 2) From Worksheet 2-5, fill in column 3: Grand total cost - the same number for each row.
- 3) Calculate the % total cost for each category. Divide column 2 by column 3 and multiply by 100.
 Example: Total cost for diesel electricity = \$1,633,813. Grand total cost = \$3,369,777. % Total cost = $\$1,633,813 \div \$3,369,777 \times 100 = 48\%$

Categories fuel type - end use	Cost for category	Total Cost	% Total cost
	\$	\$	%
	\$	\$	%
	\$	\$	%
	\$	\$	%
	\$	\$	%
	\$	\$	%
Totals	\$	\$	%

Worksheet 2-7: Calculate Greenhouse Gas Emissions

(1 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure greenhouse gas emissions for each fuel. We use kilograms of carbon dioxide equivalent as the standard measure.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the grand total at the end.

Fuel	Amount	Units	Conversion factor	Total Kg CO ₂ EQ
Diesel – electricity		Litres	X 2.73	Kg CO ₂ EQ
Natural gas – electricity		M ³	X 1.89	Kg CO ₂ EQ
Hydro – electricity		KWh	X 0	Kg CO ₂ EQ
Wind – electricity		KWh	X 0	Kg CO ₂ EQ
Solar – electricity		KWh	X 0	Kg CO ₂ EQ
Electricity subtotal				kg CO₂EQ

Worksheet 2-7: Calculate Greenhouse Gas Emissions (2 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure greenhouse gas emissions for each fuel. We use kilograms of carbon dioxide equivalent as the standard measure.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the grand total at the end.

Fuel	Amount	Units	Conversion factor	Total Kg CO ₂ EQ
Fuel oil or diesel – heating		Litres	X 2.73	Kg CO ₂ EQ
Gas – heating		M ³	X 1.89	Kg CO ₂ EQ
Propane		M ³	X 1.5	Kg CO ₂ EQ
Solar air/water, waste heat recovery		MJ	0	Kg CO ₂ EQ
Firewood & wood pellets			0	Kg CO ₂ EQ
Heating subtotal				Kg CO₂EQ

Worksheet 2-7: Calculate Greenhouse Gas Emissions (3 of 3 pages)

- 1) From your survey sheets, enter the total amount of each type of fuel on the appropriate line below. Be sure your units match the units on the worksheet so the conversion factor is correct.
- 2) Multiply the amount of fuel by the conversion factor, to measure greenhouse gas emissions for each fuel. We use kilograms of carbon dioxide equivalent as the standard measure.
- 3) Add up the subtotals for electricity, heating, and transport. Add up the grand total at the end.

Fuel	Amount	Units	Conversion factor	Total Kg CO ₂ EQ
Gasoline – transport		Litres	X 2.36	Kg CO ₂ EQ
Diesel – transport		Litres	X 2.73	Kg CO ₂ EQ
Transport subtotal				Kg CO₂EQ
Grand total (electricity subtotal + heating subtotal + transport subtotal)				Kg CO₂EQ

Kg CO₂EQ per person: Grand total Kg CO₂EQ ÷ # people in community = Average Kg CO₂EQ per person

Kg CO₂EQ ÷ = Kg CO₂EQ/person

Worksheet 2-8: Calculate % Total Greenhouse Gas Emissions

- 1) From Worksheet 2-7, fill in columns 1 and 2: Categories and kg CO₂EQ per category.
- 2) From Worksheet 2-7, fill in column 3: Total kg CO₂EQ – the same number for each row.
- 3) Calculate the % total kg CO₂EQ for each category. Divide column 2 by column 3 and multiply by 100. Example: Total kg CO₂EQ = 6,686,750. Total kg CO₂EQ for diesel-electricity = 2,169,627. % Total kg CO₂EQ = $2,169,627 \div 6,686,750 \times 100 = 32\%$

Categories: fuel type - end use	kg CO ₂ EQ per category	Total kg CO ₂ EQ	% kg CO ₂ EQ
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
	kg CO ₂ EQ	kg CO ₂ EQ	%
Totals	kg CO₂EQ	kg CO₂EQ	%

Worksheet 2-9: Calculate % Electricity and % Waste Heat from a Power Plant

Use this worksheet if your community has a diesel or natural gas power plant.

- 1) From Worksheet 2-3, fill in column 1: Total MJ electricity from power plant.
- 2) From Worksheet 2-3 fill in column 2: Total MJ diesel-electricity.
- 3) Calculate % Electricity: Divide column 1 by column 2 and multiply by 100. Example: Total MJ electricity from power plant = 9,189,288. Total MJ diesel for electricity = 28,928,354. % Electricity = $9,189,288 \div 28,928,354 \times 100 = 32\%$
- 4) Calculate % Waste heat: Subtract % Electricity from 100%. Example: Electricity = 32%. % Waste heat = $100\% - 32\% = 68\%$.

Total MJ Electricity from Power Plant	Total MJ Diesel for electricity	% Electricity	% Waste heat

Worksheet 2-10: Calculate the width of the arrows

(1 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width = 4 inches.

Left hand (LH) arrows

- Fill in Columns 1 and 2 from Worksheet 2-4. Use the same categories.
- To calculate Column 3: LH arrow width - Multiply % Total MJ by 4 inches. Example: Diesel–electricity = 29% of total MJ. $29\% \times 4 \text{ inches} = 1.2 \text{ inches}$. The LH arrow for diesel–electricity is 1.2 inches thick.

Category: fuel – end use	% Total MJ	LH arrow width

Worksheet 2-10: Calculate the width of the arrows

(2 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width = 4 inches.

Waste heat and electricity arrows

- From Worksheet 2-8 fill in Row 1: % waste heat and % electricity.
- From page 1 of this worksheet, fill in Row 2: Width LH arrow for diesel-electricity – the same number across the row.
- To get the width of the waste heat arrow, multiply the width of the LH arrow by the % waste heat. Example: % waste heat = 68%. LH diesel-electricity arrow = 1.2 inches. Waste heat arrow = 68% x 1.2 inches = .8 inches.
- To get the width of the electricity arrow, multiply the width of the LH arrow by the % electricity. Example: % electricity = 32%. LH diesel-electricity arrow = 1.2 inches. Electricity arrow = 32% x 1.2 inches = .4 inches.

	Waste heat	Electricity
1) % Diesel for electricity	%	%
2) Width LH Diesel for electricity arrow		
3) Width waste heat and electricity arrows		

Worksheet 2-10: Calculate the width of the arrows

(3 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width of arrows = 4 inches.

Right hand (RH) arrows - Electricity

- Use Worksheet 2-1: Survey Energy Suppliers, to fill in Rows 1 and 2. Divide Row 2 by Row 1 and multiply by 100 to get Row 3: % Electricity.
- Fill in Row 3 with 45% homes and 55% other buildings if the surveys don't have the information you need.
- Use number from page 2 of this worksheet to fill in Row 4 – the same number across the row.
- To get Row 5 multiply the percent in Row 3 by the number in Row 4. Example: % electricity homes = 45%. Electricity arrow = .4 inches. RH arrow = $.4 \times 45\% = .2$ inches.

Electricity	Homes	Other buildings
1) MJ electricity used		
2) Total MJ electricity		
3) % Electricity		
4) Width electricity arrow		
5) Width RH arrow		

Worksheet 2-10: Calculate the width of the arrows

(4 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width of arrows = 4 inches.

Right hand arrows – Diesel for heating and transport

- Use Worksheet 2-1 to fill in Rows 1 and 2. Divide Row 2 by Row 1 and multiply by 100 to get the % Diesel – Row 3.
- Fill in Row 3 with 25% homes, 25% other buildings, 50% transport if the surveys lack the information you need.
- Use numbers from page 1 of this worksheet to fill in Row 4.
- To get the width of the RH arrow, multiply the number in Row 3 by the number in Row 4.

Diesel or fuel oil	Homes	Other buildings	Transport
1) MJ diesel used			
2) Total MJ diesel			
3) % Diesel			
4) Width LH diesel arrow			
5) Width RH arrow			

Worksheet 2-10: Calculate the width of the arrows

(5 of 5 pages)

- Based on a poster 22 inches X 34 inches.
- Assume that 100% width of arrows = 4 inches.

Right hand arrows – Wood and Gasoline

- Assume 100% wood goes to homes, unless you have different, more detailed information about your community. The RH wood arrow is the same width as the LH wood arrow. See page 1 of this worksheet.
 - Assume 100% of gasoline goes to transport. The RH gasoline arrow is the same width as the LH gasoline arrow. See page 1 of this worksheet.
-

Appendix 2-B: Sample energy profile poster and Excel spreadsheet

Here is a sample energy profile poster as created by the Excel spreadsheet. Look for the Excel file on the CD that comes with the Toolkit.

Appendix 2-C: Community Energy Profile report template

Use the report template to create your own energy profile report. Look for the report template on the CD that comes with the Toolkit. It has a Word file you can use to insert information and a PDF file so you can see what the finished report should look like.