2015-2016

Cost of a Thanksgiving Meal

Grade Levels:

- Elem Elementary
- Int Intermediate
- Sec Secondary

Subject Areas:

- Science
- Math

NEED
National Energy Education Development Project

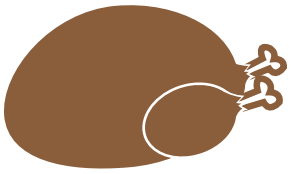
The Cost of Cooking a Thanksgiving Meal

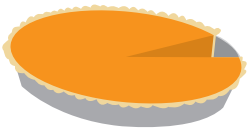
Background

Each year, the American Farm Bureau Federation analyzes the cost of the ingredients and items needed to make a traditional Thanksgiving dinner. Buying the turkey, cranberries, vegetables, and rolls adds up— but the costs don't end there! It also costs money to store and cook all of that food. The activities that follow will help you calculate the overall energy costs involved with making your Thanksgiving meal.

Make a List and Check it Twice!

What is on your menu this Thanksgiving? What appliances will you need in order to store, prepare, bake, roast, and warm all of the items on your menu? On the chart below, list your menu item, and the appliances that will be involved from start (storing items in the refrigerator until it is time to cook) to finish (running the dishwasher to clean up).





MENU ITEM	APPLIANCE(S) NEEDED

Thanksgiving Meal Appliance Inventory

It often takes many appliances to make a Thanksgiving meal. Make a list of every electrical appliance you will be using to store, prepare, cook, and clean everything that will be on your Thanksgiving table. If you've completed the list on page 2, add these appliances here. Did you use a computer or other electronic device to find and print recipes? Don't forget to include those machines as well! In this activity we will focus on electricity, but you may also cook with a natural gas stove or oven. Counting costs for these appliances can be pretty similar, but let's focus just on electrical appliances for now.

Some appliances use more energy than others to accomplish the same task. Appliances that are very energy efficient are approved by the government's ENERGY STAR® program and have the ENERGY STAR® label on them. This means they have met high standards set by the government for energy efficiency. Look for the ENERGY STAR® label on appliances you will be using to prepare, cook, and store your Thanksgiving meal. Check off appliances that include this label, and make notes about settings or modes that are more efficient.

MACHINE OR APPLIANCE	ENERGY STAR® LABEL

Electric Nameplates Investigation

Every machine that runs on electricity has an electric nameplate on it. The nameplate is usually a silver sticker that looks like the picture below. The nameplate has information about the amount of electricity the machine uses. Sometimes, the current is listed. The current is measured in amperes (A). Sometimes, the voltage the machine needs is listed. The voltage is listed in volts (V). Sometimes, the wattage is listed. The wattage is measured in watts (W). If the wattage isn't listed, then the current and voltage are both listed.

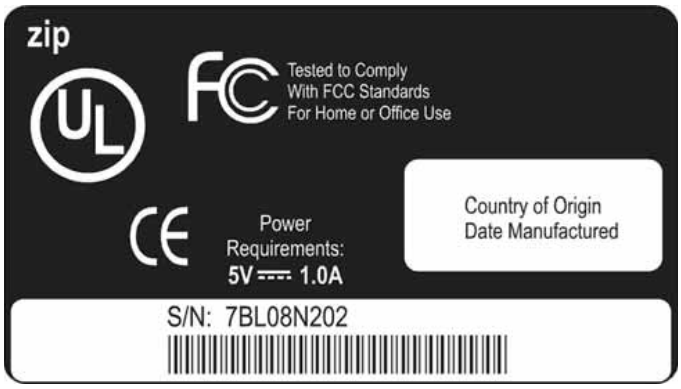
If the wattage is not listed, you can calculate the wattage using the following formula:

Power = current x voltage

Watts = A x V

Watts = 1.0A x 5V

Watts = 5W



Often, the letters UL are on the nameplate. UL stands for Underwriters Laboratories, Inc., which conducts tests on thousands of machines and appliances. The UL mark means that samples of the machines and appliances have been tested to make sure they are safe.

You can find out how much it costs to operate any appliance or machine if you know the wattage. Let's take a look at some of the machines on your list. The nameplate is usually located on the bottom or back. See if you can find the nameplates on the devices you'll be using to cook your meal. Put the information in the chart below and figure out the wattage for each one.

MACHINE	CURRENT	VOLTAGE	WATTAGE	UL TESTED

Cost of Cooking Your Thanksgiving Meal

Using the information from the nameplate investigation, calculate how much it costs to operate the electrical appliances in your home to prepare your Thanksgiving meal. You need to know the wattage, the cost of electricity, and the number of hours each appliance or machine was used.

Electricity is measured in kilowatt-hours, or energy used in a period of time. You will need to change the watts to kilowatts. One kilowatt is equal to 1,000 watts. To get kilowatts, you must divide the watts by 1,000. Using Grandma's old oven as an example, divide like this:

kW = W/1,000

kW = 9,600/1,000 = 9.6

The average **cost of electricity for residential customers in the U.S. is about twelve cents ($0.12)** a kilowatt-hour. You can use this rate or find out the actual rate from your electric bill. Using the average cost of electricity, we can figure out how much it costs to run Grandma's old oven by using this formula:

Thanksgiving Meal Cost = Hours used x Kilowatts x Cost of electricity (kWh)

Thanksgiving Meal Cost = 10 hours x 9.6 kW x $0.12/kWh

Thanksgiving Meal Cost = 10 hours x 9.6 kW x $0.12 = $11.52

Perhaps you have a much newer oven. Fill in your own appliances and calculate the cost to use the appliances using the chart below. You may need to go on to the next page as well.

MENU ITEM	MACHINE OR APPLIANCE	HOURS USED	WATTS (W)	KILOWATTS (kW)	RATE ($/kWh)	THANKSGIVING MEAL COST
Turkey	*Oven*	*10*	*9,600 W*	*9.6 kW*	*$0.12*	*$11.52*

MENU ITEM	MACHINE OR APPLIANCE	HOURS USED	WATTS (W)	KILOWATTS (kW)	RATE ($/kWh)	THANKSGIVING MEAL COST

The Environment and You

When we breathe, we produce carbon dioxide. When we burn fuels, we produce carbon dioxide too. Carbon dioxide (CO_2) is a greenhouse gas. Greenhouse gases hold heat in the atmosphere. They keep our planet warm enough for us to live. Since the Industrial Revolution, we have been producing more carbon dioxide than ever before.

Research shows that greenhouse gases are trapping more heat in the atmosphere. Scientists believe this is causing the average temperature of the earth's atmosphere to rise; this is called global climate change or global warming. Global warming refers to an average increase in the temperature of the atmosphere, which in turn causes changes in climate. A warmer atmosphere may lead to changes in rainfall patterns, a rise in sea level, and a wide range of impacts on plants, wildlife, and humans. When scientists talk about the issue of climate change, their concern is about global warming caused by human activities.

Besides breathing, there are lots of things humans do to add carbon dioxide to the atmosphere. Driving cars and trucks produces carbon dioxide because fuel is burned. Heating homes by burning natural gas, wood, heating oil, or propane produces carbon dioxide too.

Making electricity can also produce carbon dioxide. Some energy sources—such as hydropower, solar, wind, geothermal, and nuclear—do not produce carbon dioxide, because no fuel is burned. Almost forty percent of our electricity, however, comes from burning coal. Another 30 percent comes from burning natural gas, petroleum, and biomass.

The general rule is that, on average, every kilowatt-hour of electricity produces 1.23 pounds of carbon dioxide. Let's use this rule to figure out how much carbon dioxide is produced by the machines and electrical devices used during your Thanksgiving meal. You can put the figures from the earlier worksheets in the boxes below. Use the figures for Grandma's old oven as an example:

CO_2 a year = wattage x hours of use x rate of CO_2/kWh

CO_2 a year = 9.6 kW x 10 hours x 1.23 lb/kWh = 118.08 lbs

MACHINE OR APPLIANCE	KILOWATTS (kW)	TOTAL HOURS USED	RATE OF CO_2/kWh	CO_2/YEAR (LBS)
Oven	*9.6 kW*	*10 hours*	*1.23*	*118.08*

Cost of Cooking NEED's Thanksgiving Meal

NEED has created a sample menu for you to use to calculate costs. Look at the chart below and complete the calculations to help NEED analyze their meal cost. NEED is using the average U.S. cost per kWh, or $0.12/kWh.

NEED's kitchen has just been remodeled and has several newer, more efficient appliances. If you recall, Grandma's old stove used 9,600 watts when baking at 350°. NEED's stove is more efficient, using only 3,500 watts when baking. The burners on NEED's stove use approximately 1,500 watts when put on their "high" setting. NEED's refrigerator is large with side-by-side doors, and an ice maker. NEED only uses its dishwasher with the "energy saver" feature turned on and the "heat dry" setting turned off.

How do your appliances compare? Consider the variables involved with certain appliances when calculating meal costs. For example, the settings used (high, medium, low), the features of the appliance (convection or broil), the number of burners or heat elements, and the age of the appliance will all affect the wattage they use and the cost of cooking your meal.

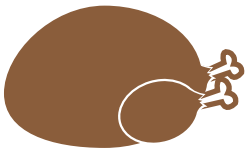
	MACHINE OR APPLIANCE	HOURS USED	WATTS (W)	KILOWATTS (kW)	RATE ($/kWh)	COST	TOTALS
turkey	*Oven*	*4*	*3,500*		*$0.12*		
	Fridge	*24*	*725*		*$0.12*		
pie	*Oven*	*1*	*3,500*		*$0.12*		
green bean casserole	*Oven*	*.5*	*3,500*		*$0.12*		
	Fridge	*24*	*725*		*$0.12*		
cranberry sauce	*Stove*	*.33*	*1,500*		*$0.12*		
	Fridge	*2*	*725*		*$0.12*		
rolls	*Oven*	*.25*	*3,500*		*$0.12*		
mashed potatoes	*Stove*	*.5*	*1,500*		*$0.12*		
gravy	*Stove*	*.25*	*1,500*		*$0.12*		
clean up	*Dishwasher*	*1.25*	*1,600*		*$0.12*		

MACHINE OR APPLIANCE	KILOWATTS (kW)	RATE OF CO_2/kWh	TOTAL HOURS USED	CO_2/PRODUCED (LBS)
Oven	*3.5 kW*	*1.23*		
Stove	*1.5 kW*	*1.23*		
Fridge	*.725 kW*	*1.23*		
Dishwasher	*1.6 kW*	*1.23*		

Analyzing NEED's Thanksgiving Meal

Look at the graphs below. These graphs help summarize how NEED used their appliances, what they cooked, and how much the energy would cost to make their menu. These graphs help them visualize and analyze their energy costs. What are the most expensive items NEED cooked? Why do you think this is? What might be missing in NEED's menu? What might NEED have missed in their calculations?

Our Menu



$3.77

$2.30

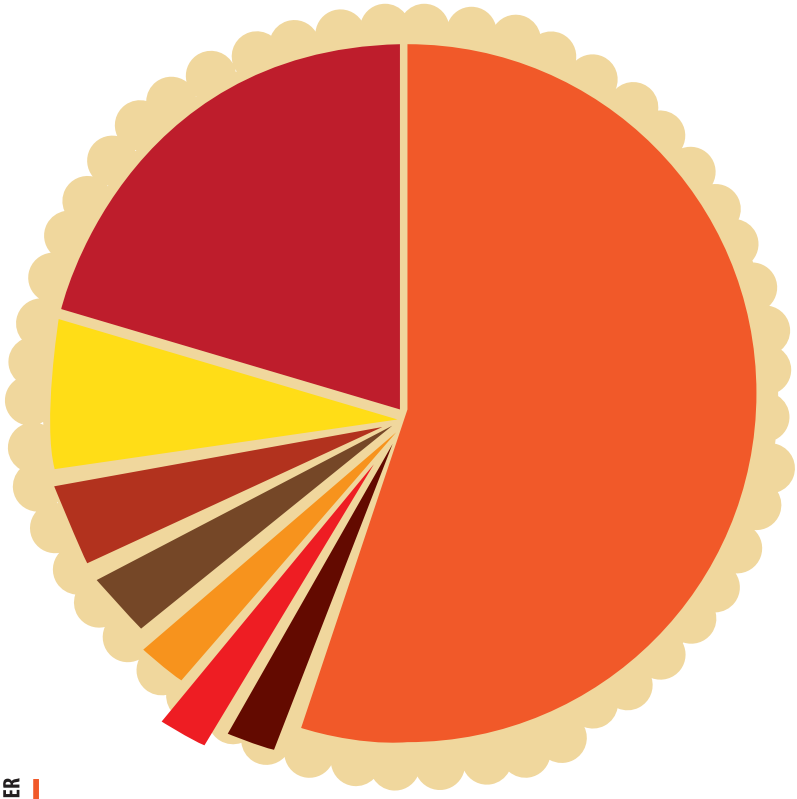
$0.42

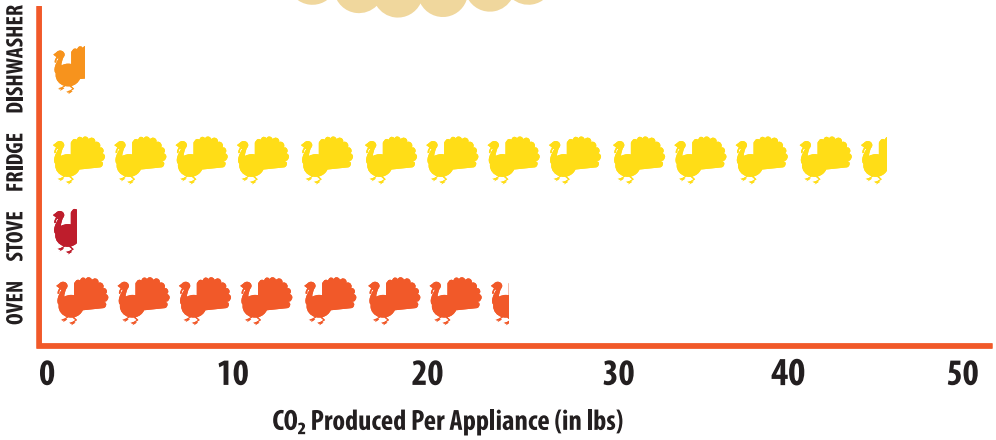
$0.23

$0.11

$0.09

$0.05





TOTAL COST

$7.21

TOTAL CO_2 PRODUCED

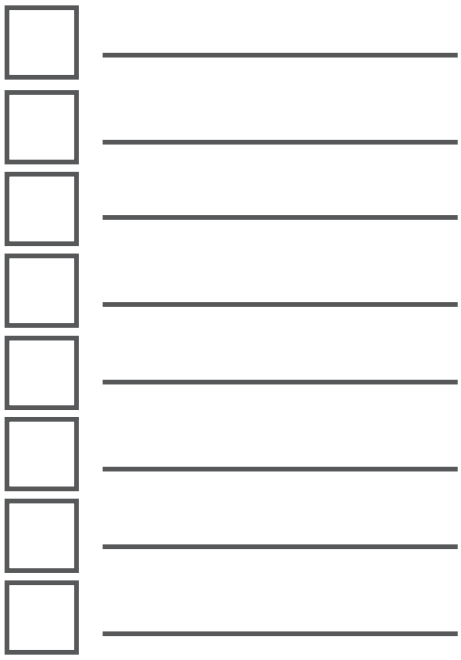
73.79 lbs

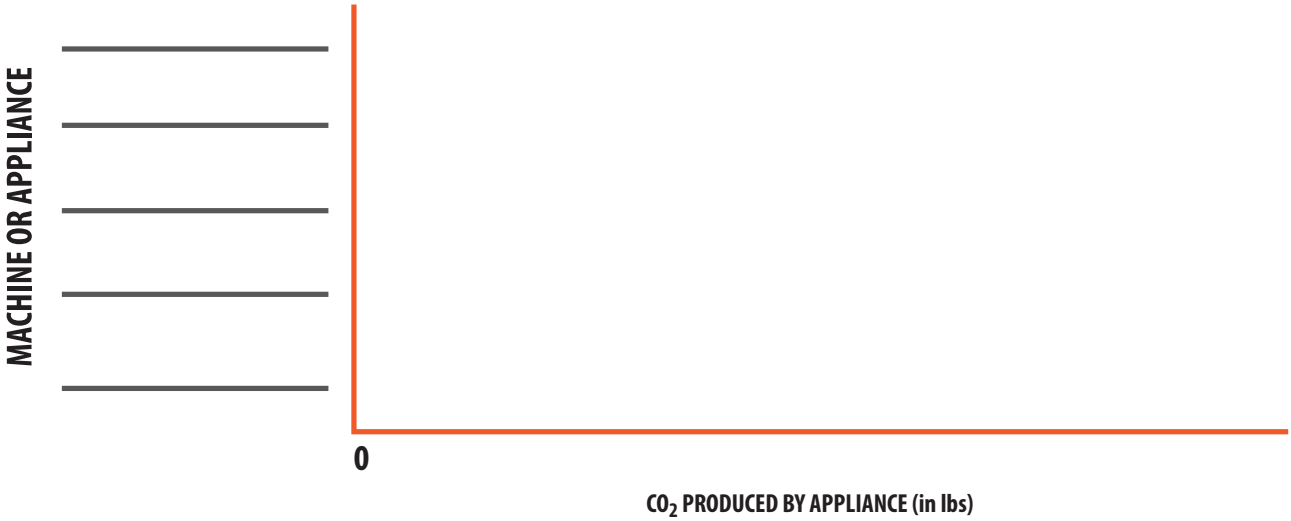
Chart Your Results

Now that you have analyzed your own menu, devices, and NEED's menu, it's time to calculate and analyze all of your totals. Use the *Cost of Cooking NEED's Thanksgiving Meal* to guide you in your total calculations. It can be tricky when adding costs together. Think about how you might use some appliances together and separately. For instance, you might use 3 burners at a time for different amounts of time and on different settings. Therefore, these must be calculated separately and added together in your total. However, you might put several dishes in the oven at the same time, and thus do not need to count them individually. Also, you may wish to research your local electricity rate by contacting your utility company, or looking at your electricity bill.

In order to think more clearly about how much you're using an appliance and what the total costs are, it might be helpful to create some charts and graphs. Use NEED's graphs as an example of how to create your own graphs. Choose colors and symbols that you like and fill in all of the graphs to represent your data. Compare your data to the data of others in your class. What might account for differences in your graphs and totals? What could you do to make your meal more energy efficient? What kind of cost might be associated with cooking meals like this every day?

MENU ITEM





TOTAL COST

$

TOTAL CO_2 PRODUCED

lbs

Happy Thanksgiving