



ENERGY EXPERT PATCH

Cadette Leader Guide

Consumers Energy

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PROVIDING ENERGY EDUCATION TO STUDENTS IN THE COMMUNITIES
WE SERVE. THAT'S OUR PROMISE TO MICHIGAN.

For more great energy resources visit:
www.ConsumersEnergy.com/kids

Hey Scout Leader!

Ready to help your Cadettes earn the Energy Expert patch? This book will help your troop to become experts at:

Page 1- Electric Safety

Page 2- Natural Gas Safety

Page 3 & 4- Energy at Home

Page 5- Sources of Energy

Page 6- Energy Careers

***This book is intended for you, the leader. Go to www.ConsumersEnergy.com/scouts to download and print copies of the Cadette Workbook for your Scouts to complete.**

Remember!

This book is designed to be completed as a group with discussions around each topic.

Once complete, please visit www.ConsumersEnergy.com/scouts to order patches.

Questions? Feel free to email us at education@consumersenergy.com

Page 1- ELECTRIC SAFETY

Things to Discuss as a Group

- Review the two terms that talk about how electricity travels:
 - Conductor:** A material that allows electricity to flow through it.
 - Insulator:** A material that stops the flow of electricity.
- Explain that conductors and insulators can be used to control the flow of electricity, making it do what we want like turning on light bulbs.

EXPERIMENT MATERIALS – purchase at your local hardware store

- D-cell battery
- Battery holder
- 1.5 volt light bulb
- Socket for the light bulb
- 3 pieces of 6-inch insulated strand copper wire (18-22 gauge) with 1 inch of insulation removed at each end of wire
- Testing materials – rubber bands, metal paper clips, wood, plastic, etc

EXPERIMENT DIRECTIONS

1. Help Scouts build their circuits (use the diagram on page 1). Test to make sure when you touch the 2 open wires together that the light bulb lights up.
 2. Let Scouts choose a material to test. Test the material by placing it in between the 2 open wires, then touching the ends of each wire to the object. If the light bulb lights up, it is a conductor. If it does not, than it is an insulator.
- Explain that water is a very strong conductor of electricity. Then explain that people are made up of over 70% water. Talk about how people are conductors of electricity.
 - Talk about how you should never touch a downed power line or an electrical socket because you don't want to become the conductor for the electricity to travel through.
 - Explain that when electricity travels through our bodies, 3 things can happen:
 - We can be shocked,
 - We can be burned,
 - Or we can be electrocuted- which means death by electricity.
 - Talk about how electricity always wants to go to the ground, so it's important to "Look up for power lines!" when climbing a tree or ladder, or flying a kite or other toys that go in the air. Electricity will travel through you- the conductor- to get to the ground.



ELECTRIC SAFETY

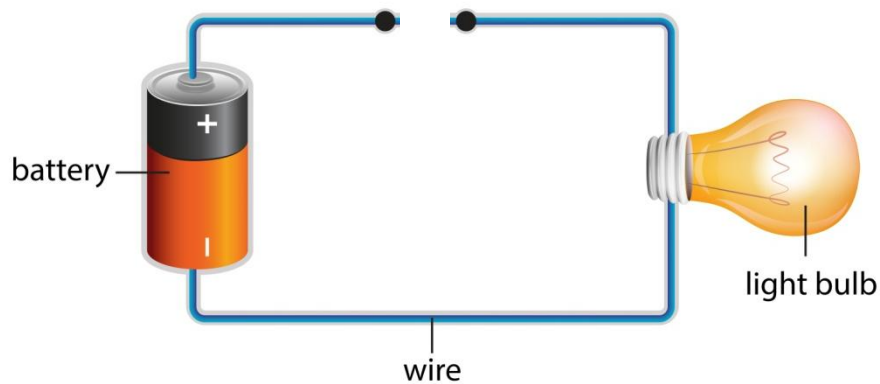
Conductors are materials that carry electricity from one place to another.

Insulators are materials that stop the flow of electricity.

EXPERIMENT!

Test materials with an adult to see if they are a conductor or an insulator of electricity.

STEP 1 – Build an electric circuit. One side should have 1 wire connecting the light bulb and battery. The other side should have 2 wires. Touch the 2 wires together to close the circuit, and the light bulb lights up!



STEP 2 – Choose your first material to test and touch the 2 wires to either side of the material. Does the light bulb light up? Write your results below.

RESULTS

Material	Did the light bulb light up?	Is this material a conductor or an insulator?
Rubber Band	No	Insulator

TRUE or FALSE (circle your answer)
People are conductors of electricity.

Page 2- NATURAL GAS SAFETY

Things to Discuss as a Group

- Natural gas is a colorless, tasteless, odorless form of energy that many people in Michigan use to heat their homes, light their stoves and dry their clothes. Explain how natural gas is an invisible gas, whereas the gasoline we put in our cars is a liquid. We add an odorant called mercaptan to it, which gives it a bad smell, much like rotten eggs. This helps people detect it in the event of a natural gas leak.
- Natural gas can leak because someone was digging and broke an underground pipe, or because an appliance that uses the gas is broken. It's important to always call 811 for MISS DIG to have the colored utility flags mark where pipes and wires are located and avoid digging accidents.
- A natural gas leak can lead to a fire or explosion, especially if a spark occurs.
- There are **six steps** one should follow if they believe natural gas is leaking at home:
 1. Tell an adult and leave the area. This means get out of the house.
 2. Do not make a spark. Lighting a match, using the telephone, light switches, garage door opener or other devices can create a spark that could ignite the natural gas.
 3. Do not try to find the source of the leak. Get out of the house immediately. Trying to detect where the leak is coming from jeopardizes one's safety.
 4. Go to a safe place. Scouts should discuss this with their parents and determine where a "safe place" is. Make sure scouts understand that they should not go to a stranger's house.
 5. Call for help. Appropriate places to call include Consumers Energy at (800) 477-5050, the local police or 911.
 6. Wait and don't go back into the house until Consumers Energy says it's OK.

SAFETY SURVEY

Have Scouts survey adults in your troop, at home or at school. Then have Scouts bring back their results to share with the troop. Explain that some adults may not know the right answers, so go over the correct answers as a group and talk about the best advice they found.

NATURAL GAS SAFETY

Natural gas smells like:

Rotten Eggs



Conduct a Safety Survey!

Ask family, friends and neighbors if you can interview them about being safe around natural gas. Write down their answers below.

Question 1: What are the little colored utility flags in the ground for?

Person 1 -

To mark underground pipes and wires-

Person 2 -

where natural gas and electricity are

Person 3 -

located.

Question 2: Why do we have to call 811 for MISS DIG before we dig?

Person 1 -

Person 2 -

So we know where not to dig and avoid breaking a gas pipe or electric line.

Person 3 -

Question 3: Why is natural gas dangerous if it gets out of the pipes?

Person 1 -

Person 2 -

Natural gas can light on fire and cause an explosion.

Person 3 -

Question 4: What should we do if we smell natural gas?

Person 1 -

Tell an adult and leave the area right

Person 2 -

away, then call 911 or Consumers Energy

Person 3 -

(800) 477-5050 in a safe place.

Page 3 - ENERGY AT HOME

Things to Discuss as a Group

- Ask Scouts what things in their houses use electricity? What things use natural gas?
- Electricity use is measured in kilowatt-hours (how many kilowatts were used in an hour) with a meter, which is usually found on the outside of homes (some are inside homes). Soon everyone will be getting smart meters which will automatically tell the energy companies how much electricity you use. Right now, meter readers come out every month and read the meter. To learn more about smart meters visit www.ConsumersEnergy.com/smartenergy
- Make sure Scouts understand that energy costs money. Using energy efficiently can result in paying less for energy and helping the environment.
- Fill in the chart together. Use the formula provided to calculate how much it costs for electricity for certain devices around the home. For the final row, Scouts can choose a device in their home, and either look up the wattage on the internet, or sometimes it says on the device (ie 1100 watt microwave).
- Have Scouts write down one thing they can do starting today to save energy.

Page 4 – Learn to Read an Energy Bill

- Explain that knowing how to read your energy bill can help save money and track how much electricity you use. You can also use math to calculate how much you can save just by not using a few extra kilowatt-hours each day.
- Go through the example bill with Scouts and help point out important numbers and answer the questions.



ENERGY AT HOME

Electricity is measured in kilowatt-hours (kWh) by a meter on your home.

Smart meters are the new way energy companies will measure your energy use, plus they will notify the energy company whenever you have an outage. Now *that's* smart energy!



How Much Does it Cost?

Electricity costs money. Being energy efficient can help the environment and save your family money!

Use this formula to calculate how much devices in your home cost.

Device	Watts	Hours Used	Kwh	Price per Kwh	Cost per day Kwh x price	Cost per year
TV	130	4	$\frac{130 \times 4}{1,000} = 0.52$	\$0.10	$0.52 \times 0.10 = \$0.05$	$\$0.05 \times 365 = \18.25
Laptop	220	6	$\frac{220 \times 6}{1,000} = 1.32$	\$0.10	$1.32 \times 0.10 = \$0.13$	$\$0.13 \times 365 = \48.18
Cell Phone Charger	3	24	$\frac{3 \times 24}{1,000} = 0.07$	\$0.10	$0.07 \times 0.10 = \$0.01$	$\$0.01 \times 365 = \3.65
You Choose!				\$0.10		

What's one thing you can do starting today to save energy?

Turn of the lights when I leave the room, take shorter showers, use a blanket instead of turning up the heat, etc

Learn to Read an Energy Bill

It might not sound like fun, but knowing how to read your energy bill is very important, to save money and know whether or not you are an energy hog!

Electric Residential Service

Rate: 10005

Kilowatt-hours used: 1358 KWH

Meter reading: 27714 - 29072 (actual)

Meter Number: 44261576

POD: 0000001472109

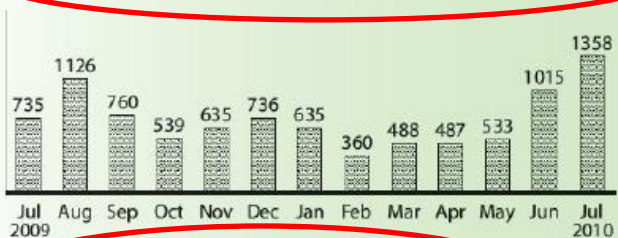
Electric Power Supply Charges

KWH-Energy First	600 @ 0.070923	\$42.55
KWH-Energy Next	758 @ 0.130992	\$99.29
Power Supply Cost Recovery	1358 @ 0.000520-	\$0.71-
Renewable Energy		\$2.50

Electric Delivery Charges

System Access		\$6.00
Elec Distribution	1358 @ 0.027489	\$37.33
Other Surcharges *		\$4.79
Energy Optimization	1358 @ 0.001430	\$1.94
Securitization	1358 @ 0.001327	\$1.80
Securitization Tax	1358 @ 0.000629	\$0.85

Total Electric \$196.34



July Electric use 1358 KWH
 Electric use per day 44 KWH
 Electric cost per day \$6.33

Gas Residential Service

Rate: 250

Thousand cubic feet used: 3.0 MCF

Meter reading: 7207 - 7237 (actual)

Meter Number: 8528536

POD: 0000001472110

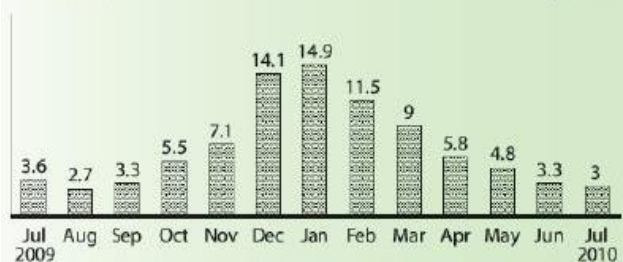
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Gas Charges

Customer Charge		\$10.50
Gas Distribution	3.0 @ 2.428900	\$7.29
Energy Optimization	3.0 @ 0.172200	\$0.52
Gas Cost Recovery	3.0 @ 6.993400	\$20.98

Total Gas \$39.29



July Gas use 3.0 MCF
 Gas use per day 0.097 MCF
 Gas cost per day \$1.27

How long is the billing period?

31 Days

How many total kilowatt-hours were used in this billing period?

1,358 kWh

What unit is natural gas measured in?

MCF = 1,000 cubic feet

How much money would you save on this bill if you used 4 kWh less per day?

$$\frac{\text{Monthly Cost } \$196.34}{\text{Monthly kWh } 1358} = \$0.14 \text{ per kWh}$$

$$40 \text{ kWh} \times 31 \text{ days} = 1,240 \times \$0.14 \text{ per kWh} = \$173.60 \text{ new month cost}$$

Old monthly cost - new monthly cost = \$\$\$ Saved

$$\$196.34 - \$173.60 = \$22.74 \text{ saved}$$

Page 5 – SOURCES OF ENERGY

Things to Discuss as a Group

- Explain to Scouts that energy can be found in many different forms all over the earth. Scientists take that energy and turn it into electricity using power plants. As the earth's population grows and more technology is invented, the demand for electricity increases. Sometimes the demand is so high there isn't enough electricity for everyone. Consumers Energy has to plan years in advance to make sure there are enough power plants to provide consistent electricity for Michigan.
- You can also have Scouts visit www.eia.gov/kids to learn more about sources for their debate.

Comparing Different Sources of Energy

Energy Source	Pros	Cons
Coal	<ul style="list-style-type: none">• Very efficient.• Can produce a lot of electricity, cheaply.• Many coal plants are already built.	<ul style="list-style-type: none">• It costs extra and takes more regulation to add equipment to keep it clean for the environment.
Natural Gas	<ul style="list-style-type: none">• We are finding a lot of natural gas in the U.S.• Burns 50% cleaner than coal.	<ul style="list-style-type: none">• New plant would have to be built.• Still not considered renewable energy.
Nuclear	<ul style="list-style-type: none">• Produces a lot of electricity.• Can be turned on and off quickly in times of need.	<ul style="list-style-type: none">• Difficult to dispose of waste.• Difficult to get permits.
Hydro	<ul style="list-style-type: none">• Clean, renewable energy.• Lots of water in Michigan.	<ul style="list-style-type: none">• Doesn't produce as much electricity.
Wind	<ul style="list-style-type: none">• Clean, renewable energy.• Michigan 14th windiest state.	<ul style="list-style-type: none">• Wind only blows enough to produce electricity 30% of the time.
Solar	<ul style="list-style-type: none">• Clean, renewable energy.• Can be installed lots of places.	<ul style="list-style-type: none">• Very expensive, more so than any other option.



SOURCES OF ENERGY

Read this story out loud.

Pretend Michigan is going through an energy crisis. There's not enough electricity to power all of the homes, businesses, or manufacturing plants, and power outages are happening everywhere. Consumers Energy has decided to build a new power plant in order to provide more electricity. But they don't know what fuel they should use. Do they use renewable, which is good for the environment, but not reliable? Or do they use non-renewable, which makes a lot of electricity at a low cost, but is not as good for the environment?

It's up to you to decide! Pick an energy source and write down why you think it is the best option.

I think the best energy source would be Wind.

This source of energy is (circle one) renewable / non-renewable.

List some benefits of using this source:

1. Clean, good for environment.
2. Michigan is pretty windy.
3. Wind turbines look nice.

List some problems with using this source:

1. Sometimes the wind doesn't blow.
2. Wind turbines are expensive to fix.
3. We can't just turn on the wind when we need more electricity.

Page 6- ENERGY CAREERS

Things to Discuss as a Group

- **Electric lineworker** -The person in this important job drives a truck and either climbs utility poles or rides in a bucket that carries him or her up to electric lines in order to work on or repair them. This job requires special training. The worker must wear protective gear such as a hard hat, rubber gloves, rubber sleeves, safety glasses, etc. and should not be afraid of heights! Sometimes, electric lineworkers are asked to help restore power in other states when energy companies need extra help.
- **Natural gas service worker**- The person in this important job drives a truck and installs or repairs natural gas lines, which are buried underground. This job requires special training. The natural gas service worker must wear protective gear such as a hard hat, safety goggles and gloves. They use shovels and clippers and operate different types of excavation equipment such as backhoes and diggers. They also are trained how to find gas leaks.
- **Customer Service Representative (call center)**- This job handles calls from customers who call for lots of reasons like asking questions about their bill, getting help turning on or off their electric and natural gas service, or reporting an emergency like a downed power line or natural gas leak. This person needs to be a good listener and problem solver.
- **Meter Reader** – This person reads the numbers on the meters attached to homes and businesses. Meters tell the reader how much electricity or natural gas the customer used in a month. The meter reader then enters the numbers on a hand-held device. This important job and process allows the company to send the correct bill to customers.
- **Engineer**- At Consumers Energy, engineers fuel the company’s brain power. They help the company provide safe, reliable and affordable energy. They design, operate and maintain power plants, and miles of electrical distribution lines and natural gas piping. Engineers usually need a four-year college degree. There are many different types of engineers including civil, environmental, chemical, electrical, computer, industrial, mechanical and material engineers. Consumers Energy uses all these different types of engineers.
- **Executive Communications**- Even an energy company needs people to help communicate to their customers! This job travels a lot and is very creative. You usually need a four-year college degree. This job requires good writing and presentation or public speaking skills.
- **Information Technology (IT)**- Consumers Energy needs many different types of IT workers from networking, to system programmers, to web designers! It takes a lot of technology to deliver reliable energy to our 6.8 million customers. IT professionals usually have a four-year degree. They must enjoy working on a computer and solving problems.
- **Forestry**- Foresters keep trees from interfering with power lines. 30% of power outages are caused by tree interference. Workers need to know how trees grow and differences between types of trees. They work closely with customers and property owners, and with crews who annually trim trees near power lines.

To see job openings at Consumers Energy, visit www.ConsumersEnergy.com/careers

- **Have Scouts interview an energy professional. Ask family members, friends, or contact us at education@cmsenergy.com to schedule a phone interview.**



ENERGY CAREERS

Match the right career with the work they like to do.

Engineer	I like working on the computer and solving problems.
Customer Service Representative	I like writing and talking in front of groups of people.
Executive Communications	I like to design things, and I'm good at math.
Information Technology (IT)	I like to talk to people and help solve problems.
Electric Lineworker	I like to be outside, ride in vans, and help people.
Forestry	I like to walk, work independently and meet new people.
Natural Gas Worker	I like to work with trees and help the environment.
Meter Reader	I like to be outside, climb high and ride in trucks.

Interview an Energy Professional

Ask your professional these questions to learn what it's like to work in energy!

Name: _____ Company: _____

What is your job description?

What are your responsibilities?

What type of training and education did you need?

What kind of tools or equipment do you use?

What do you like best about your job?