



ENERGY EXPERT PATCH

Junior Leader Guide

Consumers Energy

Count on Us

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

Page 1- Electric Safety

Page 2 & 3- Natural Gas Safety

Page 4 & 5- Energy at Home

Page 6- Sources of Energy

Page 7- Energy Conservation

Page 8- Energy Audit

Page 9- Energy Pioneers

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

Remember!

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

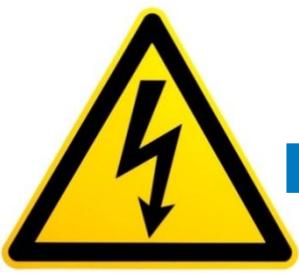
Once complete, please visit www.ConsumersEnergy.com/scouts to order patches.

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

Page 1- ELECTRIC SAFETY

Things to Discuss as a Group

- Electricity travels at the speed of light, which is 186,000 miles per second! That's why it's important to understand the correct way to handle yourself around electricity. There are no second chances if you make a mistake!
- There are three things that can happen if a person comes in contact with electricity:
 - Shock:** An electric shock occurs when a person comes into contact with an electrical energy source. Electrical energy flows through a portion of the body causing a shock.
 - Burn:** This is the most common injury. An electrical burn can range from mild to severe. A severe burn may cause permanent damage.
 - Electrocution:** This means "to be killed by electricity." Make sure Scouts understand the difference between shocks, burns and electrocution.
- Review the two terms that talk about how electricity travels:
 - Conductor:** Allows electricity to flow. Examples include metal and water. Our bodies also are conductors. Water is an especially powerful conductor of electricity. An important phrase to remember is "Electricity, People, Water Don't Mix!" When using something electrical, stay away from water (e.g., sharing a bathroom: if someone is brushing their teeth, don't use a hair dryer or curling iron near them.)
 - Insulator:** Stops the flow of electricity. Examples include glass, special types of plastic and rubber. The gloves worn by electric lineworkers are made of a special type of rubber that helps protect them from electrical shock, burn or electrocution. NOTE: Not all types of rubber can stop the flow of electricity, only the kind made for those who work with electricity.
- Never fly a kite near power lines. Always check for power lines before climbing a tree or ladder. If you see any, don't climb the tree. An important phrase to remember is "Look up for power lines!"
- If you see a downed power line, stay at least 25 feet away from it. Turn and go in the opposite direction of the power line, and tell an adult to call us right away at (800) 477-5050 so we can fix it.



ELECTRIC SAFETY

3 things can happen if you touch electricity, you can be:

1. Shocked
2. Burned
3. Electrocute

Conductor allow electricity to flow.

Write down an example: Metal, Water

Insulators stop the flow of electricity.

Write down an example: Rubber, Plastic, Glass

TRUE or FALSE (circle the answer)

People are conductors of electricity

Pretend a jump rope is a downed power line. Act out with your troop how you should react, then draw it here.

Get a jump rope, lay it on the ground and tell Scouts to pretend they are walking by when they notice a downed power line. Explain that you must stay at least 25 feet away from a downed power line. Show them how far away 25 feet is and practice with Scouts.

Remember!

Electricity, people, water DON'T mix!

Look up for POWER LINES when climbing a tree or flying a kite

Stay away from downed power lines and call Consumers Energy right away (800) 477-5050

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.
- 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.
- Explain how underground pipes and wires bring natural gas and other utilities to our homes, schools and businesses. Without them, we wouldn't have things like water, heat, or cable television!
- Colored flags mark the different kinds of underground pipes or wires so when we have to dig we can avoid hitting and breaking a pipe. Each utility has its own colored flag:
 - Yellow:** Natural Gas pipe
 - Red:** Electric line
 - Orange:** Cable or telephone line
 - Blue:** Water pipe
 - Brown/Dark Green:** Sewer pipe
 - Others:** Pink and white flags are used for surveying and new construction. Sometimes, MISS DIG uses paint instead of flags, especially if the area being marked is concrete or asphalt.
- Natural gas can leak because someone was digging and broke an underground pipe, or because an appliance that uses the gas is broken. A natural gas leak can lead to a fire or explosion, especially if a spark occurs.

NATURAL GAS SAFETY

Natural gas smells like:

Rotten Eggs



Take the Right Steps

Write the safety phrase under the right picture to learn how to react to a natural gas leak!



**Tell an adult,
leave the area**



Don't make a



**Don't try to find
the smell**



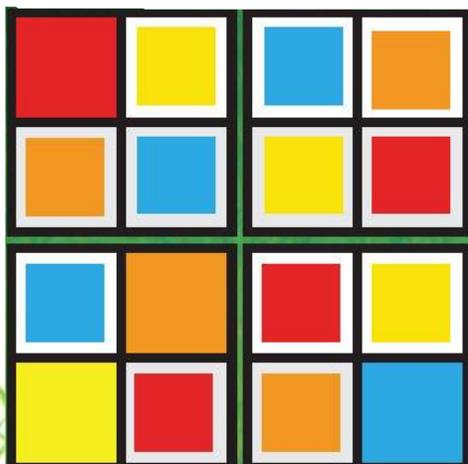
**Go to a safe
place**



**Call for help
911 or 800-**



**Wait until Consumers
Energy says it's safe
again**



Utility Flag Sudoku

Color in the flags, so that each color flag only appears once in each row, column and box. (red, orange, yellow, blue)

The flags tell us what is underground!

Yellow = Natural Gas

Red = Electricity

Green = Sewer

Blue = Water

Orange = Cable/Telephone

Page 3 – GONE BANANAS ACTIVITY

Materials

- One ripe banana per Scout or per group of Scouts, with the ends cut off.
- Plastic spoons.
- Plastic knives.

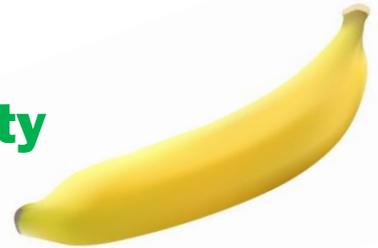
Directions

1. Pass out bananas and silverware to Scouts. Make sure Scouts are ready to write down their findings in their workbooks.
2. Explain how the banana is like an underground natural gas pipe. The peel, yellow like the pipes, keeps the natural gas from escaping.
3. Explain that sometimes people dig and hit natural gas pipes with their tools.
4. Have Scouts pick up their spoon. Tell them this is their shovel. Have them dig into the gas pipe and record what happens.
5. Next have Scouts pick up their knife. Tell them this is their backhoe (a large machine used for big digging projects). Have them dig into the gas pipe and record what happens.
6. Have Scouts show off their gas pipes. Talk as a group about how when the pipe (banana peel) is damaged, the gas (banana fruit) can get out, causing a fire or explosion. Even small damage, like the spoon, can let natural gas escape.
7. Explain that before digging its important to always call MISS DIG at 811 to avoid hitting natural gas pipes, underground wires, or other utilities. Calling 811 is free and only takes 3 days.



Gone BANANAS! Activity

Fill in the answers with your pack.



1. How do natural gas, electricity, water, cable and telephone get to your house?

Through underground pipes and wires.

2. What does the banana represent?

Natural gas pipe.

3. What do the spoon and knife represent?

Digging tools, shovels.

4. What happened when you hit the spoon into the banana?

It dented the peel, or it made a small hole.

5. What happened when you dug into the banana with the knife?

It made a large cut in the banana peel, the fruit came out.

6. What would happen if someone was digging and hit a natural gas pipe?

Natural gas would escape and cause a fire or explosion.

How can you avoid hitting a natural gas pipe? (circle the answer)

Call 811 / Call the police / You can't avoid it

How much does it cost? (circle the answer)

1 million dollars / **FREE** / 25 dollars

How long does it take? (circle the answer)

1 week / 1 year / **3 Days**

Page 4 & 5 - ENERGY AT HOME

Things to Discuss as a Group

- Ask Scouts what things in their houses use electricity? What things use natural gas?
- Go over the diagram on page 4 and talk about how electricity is generated and gets to the home. Explain that electricity can be generated using different sources (coal, oil, natural gas, wind, water, solar). This will be explained more in the next lesson “Sources of Energy” on page 5.
- 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).
- Energy use is measured using a gas or electric 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

ENERGY AT HOME

How DOES electricity get to your house?

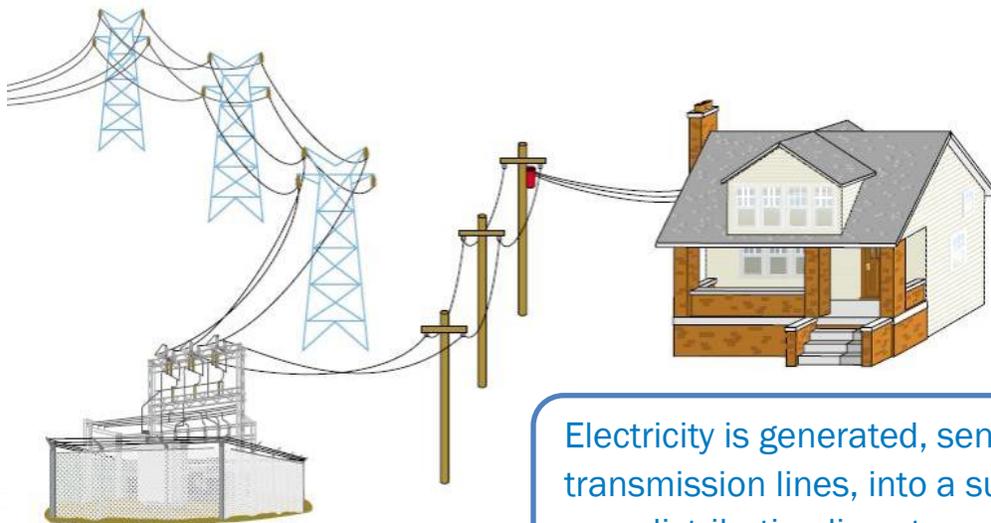
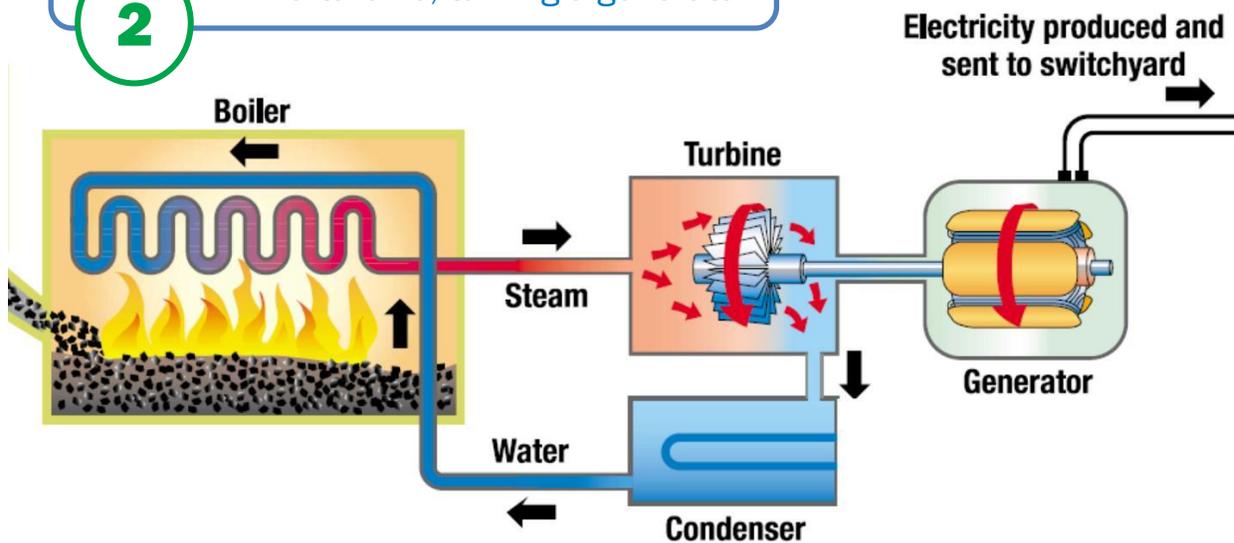


1

Coal is mined out of the ground, and sent on trains and boats to a power plant

Coal is burned to make steam, which turns a turbine, turning a generator

2



3

Electricity is generated, sent through transmission lines, into a substation, then over distribution lines to your house!

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		

How can you use these devices differently to help save energy?

Unplug the cell phone charger when not using it, watch less TV, shut down laptop when not using it.

Page 6- SOURCES OF ENERGY

Things to Discuss as a Group

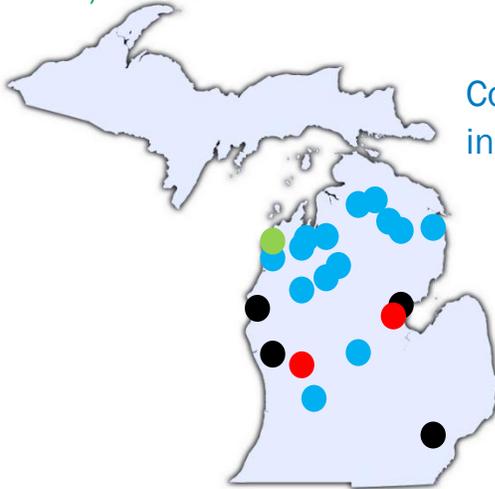
- Explain to Scouts that energy can be found in many different forms all over the earth. Scientists take that energy and turn it into electricity using power plants. Some of these energy sources are **renewable**, meaning we can use them over and over again, examples include wind, water and solar. Some energy sources are **non-renewable**, meaning once we've used them they are gone, examples include coal, natural gas, and oil.
- Fuel definitions (From the Glossary of Terms provided by the Energy Information Administration of the U.S. Department of Energy).
 - **Coal:** A fossil fuel formed by the breakdown of vegetable material trapped underground without access to air.
 - **Natural Gas:** An odorless, colorless, tasteless, non-toxic clean-burning fossil fuel. It is usually found in fossil fuel deposits and used as a fuel. Natural gas is a natural resource. Many furnaces, clothes dryers and stoves operate using natural gas.
 - **Oil:** The raw material that petroleum products are made from. A black liquid fossil fuel found deep in the Earth. Gasoline and most plastics are made from oil.
 - **Solar Energy:** The sun's radiant energy can be converted into other forms of energy, such as heat or electricity. This is a renewable energy source.
 - **Water Cycle:** Water constantly moves through a vast global cycle, in which it evaporates from lakes and oceans, forms clouds, precipitates as rain or snow, and then flows back to the ocean. The energy of this water cycle, which is driven by the sun, is tapped most efficiently with hydropower. Water is a renewable energy source.
 - **Wind:** The term given to any natural movement of air in the atmosphere. A renewable source of energy used to turn turbines to generate electricity.

Other Ideas- Have Scouts pick which energy source they think is best and tell the group why.

SOURCES OF ENERGY

Non-renewable energy sources are fossil fuels like coal, oil, and natural gas.

Renewable energy sources can be reused like wind, water, and solar.



Consumers Energy has many power plants in Michigan that use different sources of energy.

- Hydro Power Plant
- Wind Farm
- Natural Gas Power Plant
- Coal Power Plant

★ Where do you live? Mark it on this map with a star. Show Scouts where you are.

TYPES OF FUEL WORDSEARCH

Coal	Natural Gas	Nuclear	Oil	Sun	Water	Wind													
C	U	P	X	E	M	F	A	V	P	L	Q	M	Y	L	K	D	F	B	E
P	L	X	V	G	A	L	U	C	M	W	I	L	X	C	T	I	S	Z	P
W	C	V	Y	I	W	S	Z	L	E	S	A	L	O	S	V	I	S	D	P
A	U	M	E	I	N	S	X	G	P	E	B	M	A	X	T	N	U	M	O
W	N	Y	S	U	A	I	C	R	C	U	M	S	I	L	A	P	N	E	M
M	L	Z	H	C	T	Q	I	P	T	J	L	F	M	T	D	A	R	W	X
P	M	Y	V	O	U	V	I	O	F	P	L	V	X	S	T	E	Y	Q	L
S	O	I	Y	X	R	M	W	A	T	E	R	A	N	K	L	T	U	D	P
J	G	A	Q	P	A	B	S	G	I	K	R	M	V	P	L	R	Y	U	Z
A	F	M	E	I	L	W	A	T	R	I	L	P	D	I	V	M	K	W	Q
I	W	P	O	X	G	X	D	J	E	Y	Z	H	K	R	S	S	C	O	X
G	R	E	U	U	A	Y	C	G	I	H	A	O	R	M	H	Q	A	L	N
T	Y	J	H	P	S	K	I	I	E	F	Y	I	B	O	L	U	O	U	T
E	I	R	R	M	B	M	L	P	C	B	E	L	M	T	Y	R	L	T	U
L	P	K	D	E	N	C	E	T	U	Y	H	E	E	P	R	F	D	R	E
R	G	L	F	U	E	A	B	E	Q	J	L	W	Z	N	I	O	R	U	D
U	B	W	B	M	R	D	L	C	Z	E	A	S	C	F	P	Y	E	I	F
M	W	I	D	N	T	U	S	M	S	S	E	P	C	O	A	L	T	G	J
O	I	Q	I	K	I	P	Z	R	U	V	E	I	R	W	D	P	Y	V	T
T	N	J	W	G	L	Q	A	F	F	P	M	O	W	Z	L	Y	W	R	R
R	D	Z	S	D	W	I	N	U	C	L	E	A	R	Q	P	M	P	C	E
E	M	C	R	C	Q	B	E	H	C	S	A	R	F	A	E	G	V	M	H

Page 7- ENERGY CONSERVATION

Things to Discuss as a Group

- Being energy efficient and conserving energy takes work. Explain to Scouts how even just a few years ago, most people did not care about how much energy they used. Explain that people who knew it was important spoke up about ways to change. Encourage Scouts to be the change in their community by creating an energy conservation pledge. *This correlates to the Get Moving Journey.
- Here are some suggestions on how to save energy to get your Scouts started:

HEATING

- Save 5-10% on you bill by closing vents and turning off radiators in unused rooms (such as spare bedroom, attic, basement and storage areas).
- Set the thermostat at 68 degrees when home, and turn it down to 65 degrees or less when you leave for several hours.

COOLING

- Operate appliances (such as: dishwasher, stove, oven, clothes dryer, etc.) in the morning when temperatures are cooler to avoid adding extra heat to your home.
- Ceiling fans cool fast and cost less than air conditioning.

INSULATION

- Adding batting and fiberglass insulation to attic is cost effective measure you can do yourself.

WATER

- Install a low flow aerator or flow restrictor on a shower head on an existing showerhead and you'll use less water. Both are inexpensive and easy to install.

COOKING

- By opening the oven door to peek at food, you could lose 25-75 degrees of heat. Look through the window and wait until the food is almost done before checking.

REFRIGERATOR

- Let foods cool before putting them away. Hot foods cause the motor to work harder.
- Set the refrigerator temperature to 38-42 degrees and the freeze to 0-5 degrees.

LIGHTING

- Replace incandescent light bulbs with more energy efficient bulbs that last longer, such as compact florescent (CFL) or LED bulbs.



ENERGY CONSERVATION

Energy Efficiency uses technology to help people use less energy.

Energy Conservation is when people change their behaviors to help lower their use of energy.

Make an Energy Conservation Pledge!

- A pledge is a promise to change your behavior.
- Make a promise that will help conserve energy.
- Make your pledge official by turning it into a poster that you can display.

Try using these materials to make it look great!

- Large foam poster board
- Markers
- Stickers
- Colored paper, tape, and ribbon
- Glitter
- Pictures

I pledge to conserve energy by: **Turn off the lights when I**

leave the room

SIGNATURE: _____

DATE: _____

Think about places you could put your poster so you will remember your pledge and where others could learn from it. Write down where you will hang your poster: _____

What kind of pictures could you draw on your poster? _____



ENERGY AUDIT

Using what you've learned about energy efficiency and conservation make a plan to perform an energy audit for a library or school in your area. Here are some suggestions to get started.

- Do some research on different energy efficiency options for common trouble areas such as windows, lighting, or heating and cooling. Some good places to start are www.energystar.gov or www.eia.doe.gov. Consumers Energy also can provide you with ideas at www.ConsumersEnergy.com/eeprograms.
- Visit www.myfootprint.org (cost \$1) or <http://www.earthday.org/footprint-calculator> (\$free) to determine your ecological footprint. These websites have you take a quiz about your energy and consumption habits and compare them to people all around the world. Your footprint is broken down into different categories including energy, transportation, food, and goods and services.
- Once you are prepared, contact a school or library and ask if you can perform an energy audit for them. Visit our lesson plan page at www.ConsumersEnergy.com/teachers and click on *Lesson Plans* and then *Saving Energy at School* to help you develop good questions to ask and areas of the building to evaluate.

ENERGY PIONEERS

Are they Isabella Karle, Marie Curie, or Zan Lombardo?

Read the stories, then research to see which name matches the scientist's description.



I was born in 1921 in Detroit, Michigan. I earned my PhD at the University of Michigan in 1943. I married and worked with another scientist, and we won the Nobel Prize for working with x-rays in 1985. I contributed over 200 research papers to the development of x-ray crystallography, the method for determining how atoms are arranged in a crystal. I was also one of the first people to successfully use the method of calculating x-rays. I am still alive today.

My name is: **Isabella Karle**

I am a current art teacher in Pennsylvania. I worked with my students at Balley Forge Middle School in Pennsylvania to make one energy efficient habit for an entire month. Then I helped my students make a giant mural to show how they helped the environment. The National Energy Foundation awarded me in 2006 for inspiring students to be energy efficient and make a difference in their community.

My name is: **Zan Lombardo**

I discovered the mysterious element radium in 1895. It opened the door to deep changes in the way scientists think about matter and energy. I had to secretly study to become a scientist because for many years it was illegal for women to go to University in my country, Poland. I worked really hard to raise enough money to move to Paris to get my Masters in Physics and Mathematics. I was the first woman to win a Nobel Prize in 1903.

My name is: **Marie**

If you had to pick one topic on energy to study, what would it be?

Power generation, conservation, environmental