



# ENERGY EXPERT PATCH

## Bear & Webelos

## 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](http://www.ConsumersEnergy.com/kids)

# Hey Scout Leader!

Ready to help your Bears and Webelos earn the Energy Expert patch?  
This book will help your pack to become experts at:

**Page 1 - Electric Safety**

**Page 3 - Natural Gas Safety**

**Page 5 - Sources of Energy**

**Page 6 - Electricity Generation**

**Page 7 - Energy Careers**

**\*This book is intended for you, the leader. Go to [www.ConsumersEnergy.com/scouts](http://www.ConsumersEnergy.com/scouts) to download and print copies of the Bear & Webelos Workbook for your Scouts to complete.**

## Remember!

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

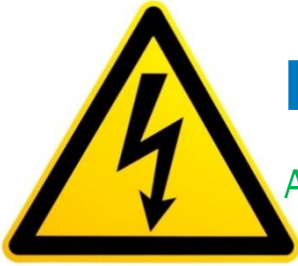
**Once complete, please visit [www.ConsumersEnergy.com/scouts](http://www.ConsumersEnergy.com/scouts) to order patches.**

**Questions? Feel free to email us at [education@consumersenergy.com](mailto:education@consumersenergy.com)**

# Page 1 & 2- 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 following safety phrases and explain their importance:
  - "Electricity, People, Water Don't Mix!" - Water is an especially powerful conductor of electricity. 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.)
  - "Look up for power lines!" - 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.
  - "Stay away, stay alive!" - 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.
- Go over these other great safety tips with Scouts:
  - Never play near a substation. If you accidentally lose a toy or ball in a substation, leave it and call Consumers Energy at (800) 477-5050 or buy a new one. No ball or toy is worth your life!
  - Stay away from any equipment that has a "Danger! High Voltage" signs on it. Ground transformers are one example of high voltage electrical equipment. They are located in large green metal boxes outside in neighborhoods. If you ever see a lock broken on one of these devices, tell an adult right away to call Consumers Energy.



# ELECTRIC SAFETY

After talking with your pack about ways to stay safe around electricity, write your 3 favorite safety tips here:

1. Stay away, stay alive — stay at least 25 feet away from downed power lines
2. Look up for power lines! When flying a kite, climbing a tree or a ladder.
3. Electricity, people, water don't mix! Keep electrical devices away from water.

**NEXT** use your safety tips to finish either “Make a Safety Poster” or “Perform a Safety Skit” on page 2.

## Make a Safety Poster

Make a poster that teaches others how to be safe around electricity.

Try using these materials to make it look great!

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

Write the safety message you will put on your poster here:

Decide with Scouts. Examples may include downed wire safety,

kite flying safety, being safe with water and electricity, etc

Talk to your pack about places in your community where a lot of people would see your poster and could learn from it. Write down where you will hang your poster: School, community center, coffee shops

What kind of pictures could you put on your poster? picture of downed power line, person calling 911, Consumers Energy truck

## Perform a Safety Skit

Write and perform a short skit with your pack for younger Scouts or even adults!

### Example Safety Skit: Stay Away, Stay Alive

Mr. Johnson: What a beautiful day! I think I'll go for a walk around my neighborhood.....(*big thud sound*).....what was that noise?

Timmy: Look, Mr. Johnson! That tree just fell down on that power line!

Mr. Johnson: Uh-oh. Timmy we need to stay at least 25 feet away. If we get too close, we could get electrocuted or shocked!

Timmy: Should we call 911?

Mr. Johnson: Good idea Timmy. (*Timmy and Mr. Johnson call 911*)(*Sirens sound*)

Fireman: You people okay? I'm glad you stayed far away from that power line or else you could have gotten hurt. I'm going to call Consumers Energy so they can come fix this. (*Fireman takes out phone and walks away*)

Consumers Energy Worker: I see we have a downed power line. Just give me awhile with my bucket truck and I'll get this place safe again. (*worker fixes the power line*) Great job everyone. Anytime you see a downed power line, stay away to stay alive.

Everyone: Stay away, stay alive!

THE END

**Title of your skit:** \_\_\_\_\_

**What safety message will the skit be about?**

*Decide with Scouts. Examples may include downed wire safety,  
kite flying safety, being safe with water and electricity, etc*

**Who will the characters be?** \_\_\_\_\_

\_\_\_\_\_

**What props will you need?** \_\_\_\_\_

\_\_\_\_\_

**Who will you perform the skit in front of?** \_\_\_\_\_



## Page 3 - 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 spark



Don't try to find the smell



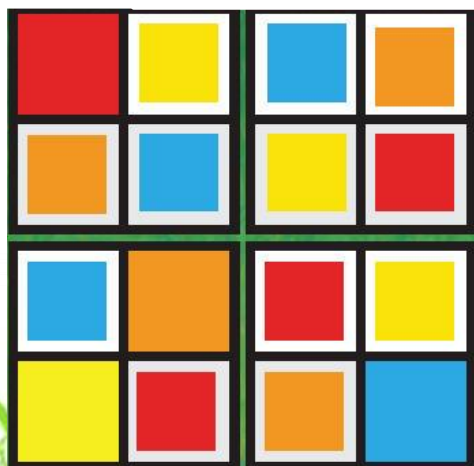
Go to a safe place



Call for help 911 or 800-477-5050



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 4 – 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 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](http://www.eia.gov/kids) to learn more about sources.

### Comparing Different Sources of Energy

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



# 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.

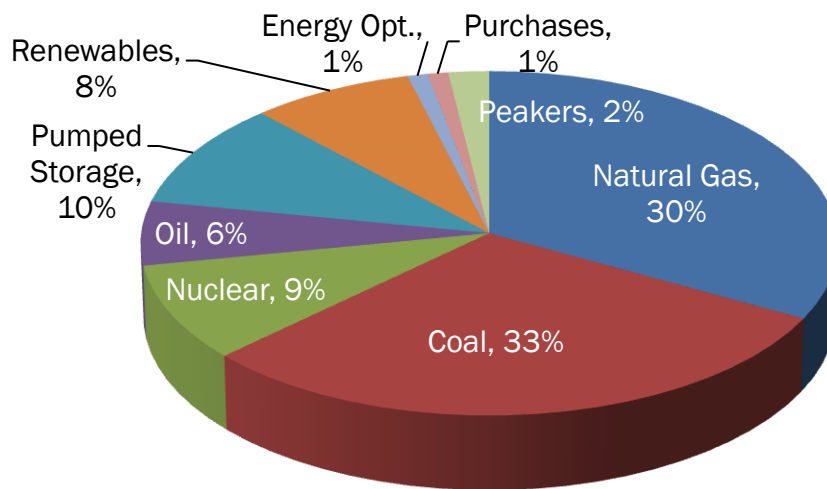
List some problems with using this source:

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 - ELECTRICITY GENERATION

### Things to Discuss as a Group

- Explain to Scouts that electricity does not come out of thin air. Energy companies, like Consumers Energy, make electricity in power plants using the many sources you just learned about in the “Sources of Energy” activity.
- The following chart breaks down electricity generation from Consumers Energy in 2013. This data is from the [2013 Accountability Report](#).

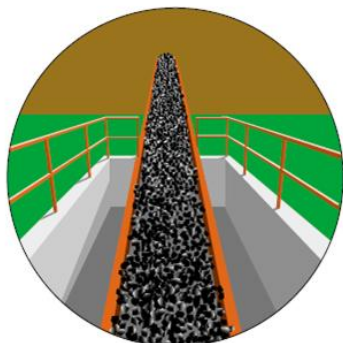


- Coal is still the most common way energy companies nationwide generate electricity. Coal, along with other sources such as oil, natural gas, nuclear, and biomass, generate some type of heat to produce steam which turns a turbine, turning a generator. Steam is a very powerful and very efficient way to generate electricity.
- Explain the following steps teaching Scouts how electricity is generated in a coal power plant and sent to their homes:
  1. Coal is mined from underground.
  2. Coal is transported, by train or boat, to power plants.
  3. The coal is fed into pulverizers that crush the coal into a fine powder.
  4. The coal powder is mixed with air and blown into the boiler where it ignites.
  5. The fire heats up water in tubes, turning the water into steam, which turns a turbine.
  6. The shaft connected to the turbine turns the generator, creating electricity.
  7. The electricity is sent over transmission lines to a substation in your neighborhood where the voltage is lowered.
  8. The electricity then travels through smaller, distribution lines to your house.

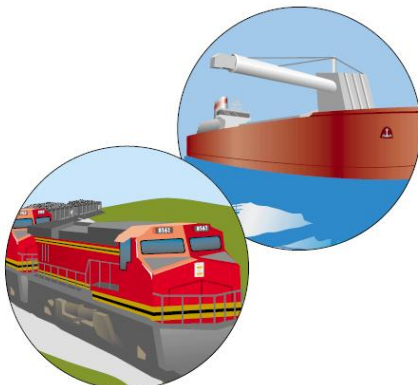


# ELECTRICITY GENERATION

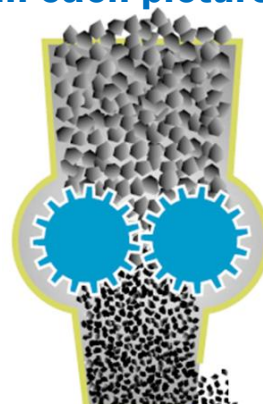
How is electricity made? Write what happens in each picture.



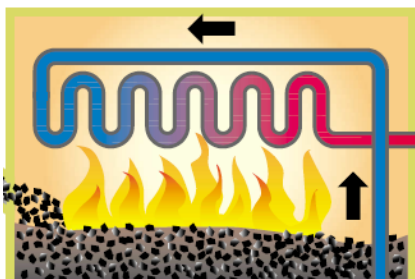
Coal is mined from the ground.



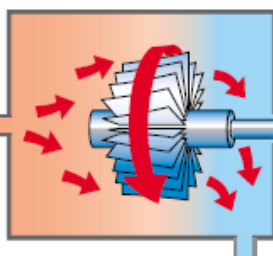
Coal shipped to power plants.



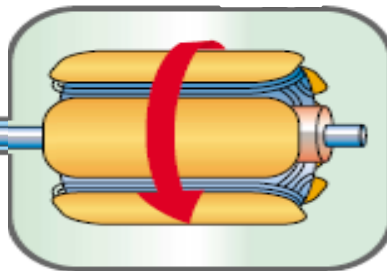
Coal is ground into a fine powder.



Coal is burned to heat water making steam.

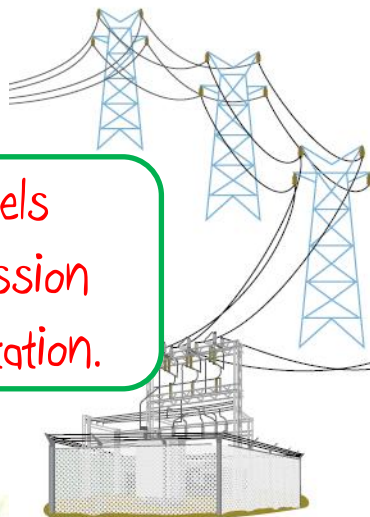


The steam turns the turbines.

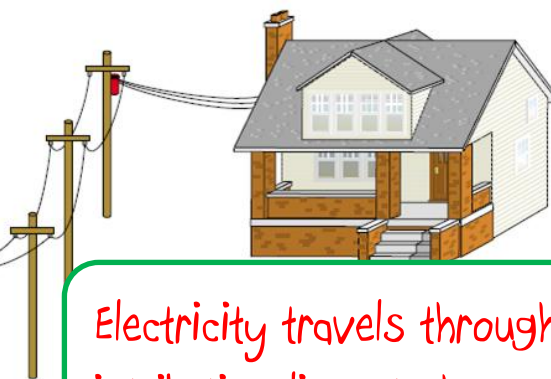


The shaft spins, turning the generator.

Electricity travels through transmission lines to the substation.



Electricity travels through distribution lines to houses.



# Page 7 & 8 - 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](http://www.ConsumersEnergy.com/careers)



# 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.

At Consumers Energy, we also have engineers who design where a natural gas pipeline goes in the ground. It's important when a new building or house is built that we get natural gas installed safely, and as inexpensive as possible.

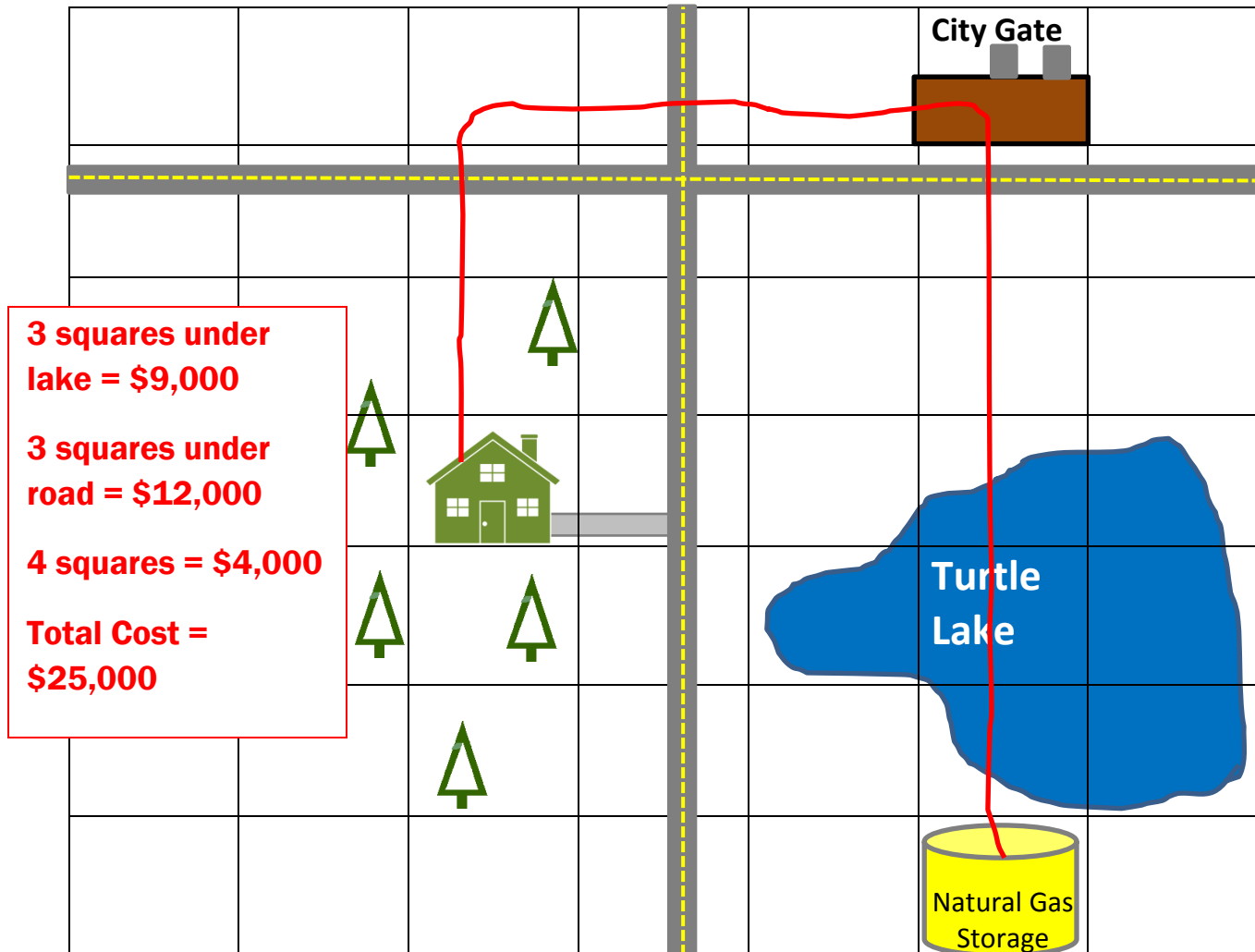
Do you like to draw? Solve problems? Plan things out?

**Find out on the next page if you could be one of these engineers!**

# Design a Pipeline!

\*Add up the squares to see how much the Scout's design cost\*

Design (draw) the gas pipeline to go from the gas storage, to the city gate, to the house – as cheaply as possible.



**1 square = 1 square mile = costs \$1,000 to lay pipe**

## Rules:

- If your pipe goes through any part of a square, you have to pay for that whole square.
- You cannot cut diagonally through the squares.
- You cannot run more than one natural gas pipe through the same square.
- Anytime you pass under a lake square it costs an extra \$2,000.
- Anytime you pass under a road square it costs an extra \$3,000.
- You MUST go to the city gate before the house, otherwise our resident's gas won't smell and that's dangerous!
- Avoid the barriers (like the drive-way or trees) or else your resident might get mad and make you do it over- doubling your cost!