Name: _____ Date: _____ Class/Period:_____

LESSON 7: POWERING OUR CITY: EXPLORING SOURCES OF ENERGY

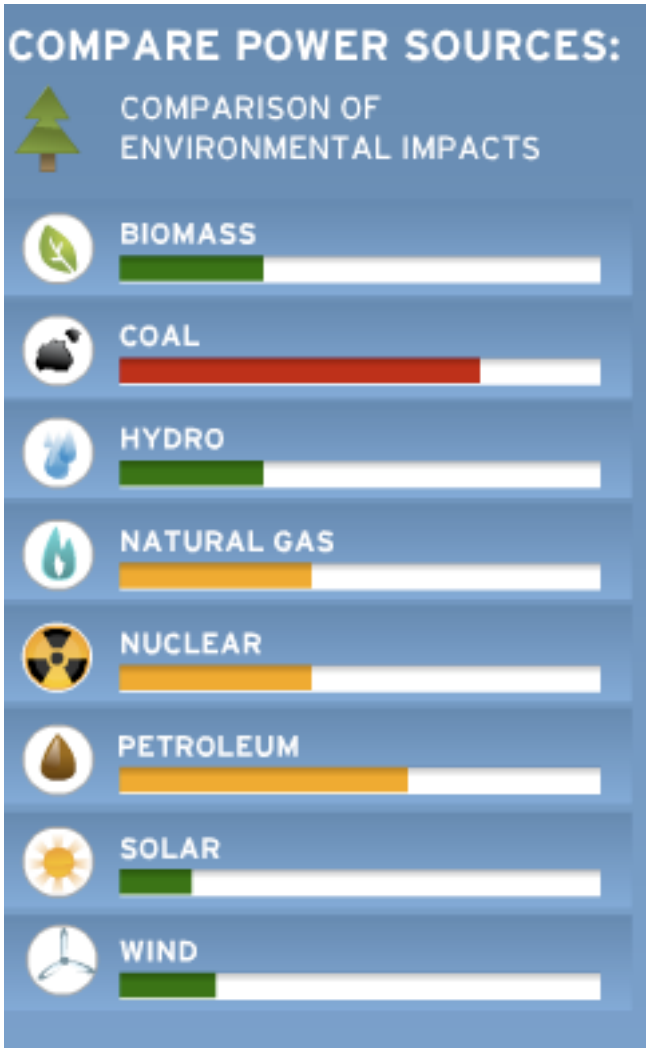
ACTIVITY 7.1. HOW WOULD YOU POWER YOUR CITY? MAKING THE CHOICES.

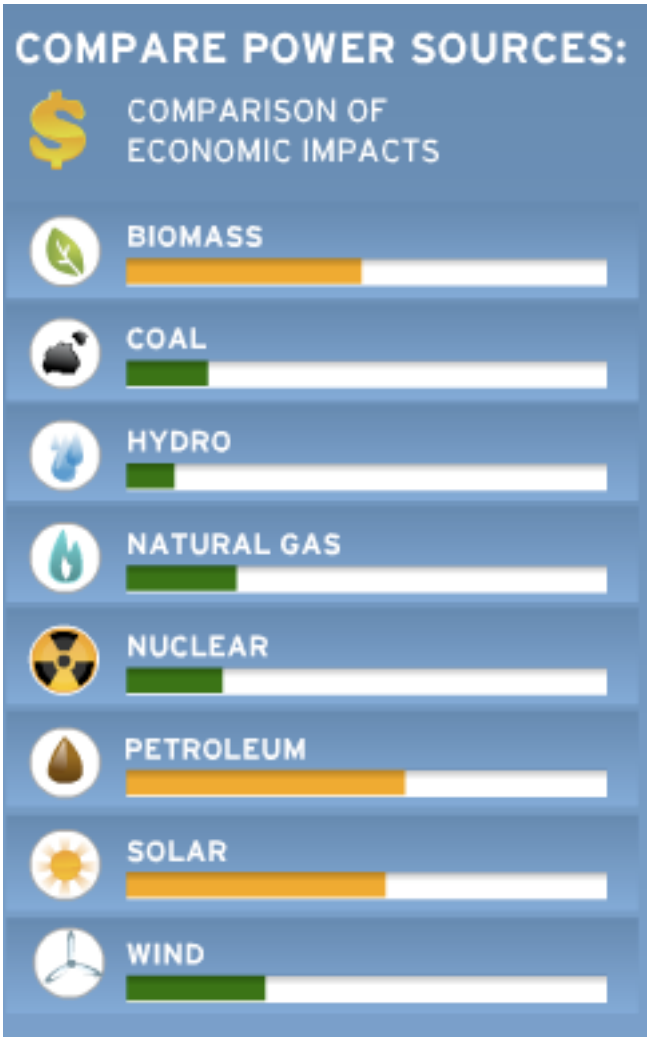
Below is a list of potential sources of energy for a city. Review the different sources of energy below. As you read through them, think about which ones produce greenhouse gasses, such as carbon dioxide, and which do not.

Source of Energy	Description
Biomass	Biological material that is used as a fuel source. Sources of biofuel include corn, corn stalks, soybeans and wood chips. Biomass includes fuels such as ethanol and biodiesel. Biomass is called a carbon neutral fuel since the release of carbon from burning the fuels may be offset by the growing of new biomass.
Coal	Coal is a sedimentary rock composed mostly of carbon and hydrocarbons and is the most abundant and inexpensive source of fuel. It is also one of the largest contributors of greenhouse gasses.
Hydro	Hydro refers to water and is one of the oldest sources of energy. Hydroelectric dams convert the energy in the flow of water to electricity.
Natural Gas	Natural gas contains gasses found in the same locations as petroleum products. These include methane, butane, and propane. Natural gas burns cleaner than coal or oil (petroleum). While it may release fewer pollutants, natural gas does produce greenhouse gasses including carbon dioxide.
Nuclear	Nuclear power uses the energy found in the nucleus of an atom through a process called nuclear fission. Nuclear fission splits an atom apart into two smaller atoms releasing energy. Generating nuclear power does not create carbon dioxide or other greenhouse gases, but does produce radioactive wastes.
Petroleum	Petroleum is also referred to as oil and is found in underground reservoirs. It is the result of millions of years of pressure and heat being applied to the remains of marine organisms. The burning of petroleum for fuel releases carbon dioxide and other pollutants including carbon monoxide, nitrogen oxides, particulate matter, and unburned hydrocarbons.
Solar	Solar energy is energy that comes directly from the sun. Solar energy is captured and converted into electricity using photovoltaic cells, or solar panels.
Wind	Wind turbines convert the energy from wind into electricity. There are small wind turbines that can be used to power a single home and large wind turbines that may be grouped together into a wind farm to provide power to a city.

1. Which of these sources do not produce greenhouse gasses?

How would you power a large city of 3.9 million people? It is unlikely that one source of power will be able to generate enough power for such a large city. You'll also need to consider the ***environmental*** and ***economic*** costs of each. You'll want to choose energy sources which your city can afford to pay for and which won't cause too much pollution. Below are some data on each source of power. For these data, the small the bar graph, the less negative impact it has on the economy or environment, respectively.





2. Based on what you learned above and the economic and environmental costs, choose sources of power for your city. You must choose up to 8 sources of energy for your city and explain why you picked that particular source. Note: you may add the same source of power more than once. For example you may have two Coal power plants. In this case, you should fill in coal for two boxes.

Power Source	Reason for choice
Example. Hydrogen	Hydrogen fuel produces no direct greenhouse gasses. Cars powered by hydrogen fuel cells are three times more efficient than combustion engines.
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

3. Which sources of power did you **NOT** choose? Why not?

ACTIVITY 7.2. POWERING YOUR CITY: MODELING YOUR CHOICES.

In this activity you will use a simulation, funded by Chevron, called Energyville, to see what the economic and environmental impacts of your choices have on a simulated city of 3.9 million people.

DIRECTIONS FOR THE ENERGY SIMULATION, ENERGYVILLE

A. Go to the website www.willyoujoinus.com
B. Click on "Play the Game" a new window will pop up.
C. Enter a name for your city and click "Play Energyville"
D. Your city will appear. You can click on the yellow "!" to find out more information about fuel needs of your city. Notice, on the right of your screen are the indicators for the economic and environmental health. These will start to change as you add fuel sources.
E. The choices for fuel sources will appear in a bar across the bottom. Referring back to the table you completed in Activity 1.1, add fuel sources. To add a fuel source, click on the icon at the bottom and drag to the city. To add more the one portion (say if you choose 2 coal plants) click on the coal icon in your city and click "add more" or click and drag the icon again.
F. If you did not include petroleum or if you used a lot of one power source, you may have to revise your plan.

4. In your city, what requires the most amount of energy to power?

5. Describe any changes you made to your energy plan below. Why did you make changes?

5. Before moving on to the next step fill in the data below:

Year	**Economic Impact** (high/medium/low)	**Environmental Impact** (high/medium/low)
End of 2015		

6. Which energy conservation and efficiency option did you choose? Why?

7. What are the events that impact the future energy of your city? Are these events positive or negative?

8. In 2015, you will need to add **FOUR** more sources of energy to keep up with your cities demand for energy. What four will you add? (list below)

Power Source	Reason for choice
1.	
2.	
3.	
4.	

9. List a Benefit and Limitation for each of the power sources.

8. Once you have completed this, fill in the chart below.

Year	**Economic Impact** (high/medium/low)	**Environmental Impact** (high/medium/low)
End of 2030		

9. What are the events that impact the future energy of your city? Are these events positive or negative?

10. What was your final score? Do you think your city was efficient?

REFECTION QUESTIONS

1. Can you explain your results based on your energy choices? Would you make any decisions differently if you were to do the simulation again?

2. Did the location of where you put your power sources affect your energy decisions? Why might location be important?

3. Do you think this is a reasonable simulation? Why or Why not?

   Do you think the funder, Chevron, had any influence on the simulation? Why or why not?