

## **Lesson Five: What Can We Learn About Natural Monopolies by Looking at Electrical Power Companies?**

### **Natural Monopolies - The Good, the Bad, and the Inevitable?**

**Introduction:** I'm sure all of you have heard of a monopoly, but it turns out that it isn't just a board game. A **monopoly** is a market structure which is dominated by just one major firm. There are many types of monopolies including legal monopolies (patents, copyrights, or trademarks), Exclusive resource ownership (when one firm owns all of a particular natural resource), or anti-competitive monopolies (like predatory pricing: selling below cost in order to drive out other firms and then hiking up the price afterwards). While economists might consider some of these monopolies to be socially justifiable, others seem to be more hurtful to society. For this reason, we have many anti-trust laws that make some kinds of monopolies illegal. One of those debatable monopolies is called a Natural Monopoly.

**Definition of Natural Monopoly:** *An industry in which having just one firm (a monopoly) is most efficient due to very high startup costs, making one firm have the lowest long run average cost (Economies of Scale).*

Now, let's spend a moment to revisit our discussion of infrastructure. Remember that infrastructure is an organized network needed to provide crucial goods and services. There are many types of infrastructure from transportation (roads, highways, bridges, etc.) to social services (hospitals, schools, etc.) and many more. Many of these infrastructure systems also may be considered natural monopolies including electricity, city roads, sewer systems, Cable TV and Internet, and more. Clearly, the issue of natural monopolies affects so many aspects of our lives, so it's so important to understand three central questions:

1. What are natural monopolies and what makes them "natural"?
2. What problems are caused by natural monopolies?
3. What are some possible solutions to avoid the problems caused by natural monopolies?

**Question 1:** What are natural monopolies and what makes them "natural"?

As mentioned above, natural monopolies are monopolies that come about because of high costs to start up and the inefficiency of having multiple firms providing the same extensive network. Economists call this "Economies of Scale", since it allows the firm to have the lowest average cost by spreading those one time (fixed) costs over many customers. Sometimes, natural monopolies come into existence "naturally" because if there were multiple firms competing, the costs would be so high that neither firm would be able to make a profit. As a result, at least one of them would exit the industry, leaving just one firm who could make a profit since they no longer split the market demand with another firm. In other words, a natural monopoly comes about organically due to the nature of the good or service being produced and the costs associated with that production! *Now let's do a little test to see whether electricity is a natural monopoly!*

**Activity One (Version 1): Creating a Power Company in Your Classroom**

Imagine this class is a city with each desk as a house that needs electricity. To produce this electricity, the power company needs a power plant and power lines. You are working for the power company to figure out how to make the city profitable.

Here are the prices and rules for the needed materials:

1. Building and operating a Power plant costs \$1,000.
2. Wiring a single house (desk) costs \$10

Now, count the number of desks in the room, and answer these questions:

1. What is the total cost of providing electricity to your city?  
\_\_\_\_\_
2. How much will the power company need to charge each house (desk) in order to break even? \_\_\_\_\_

Now, imagine there were two power companies in the classroom. Now, answer the following questions:

1. What is the new total cost of providing electricity to the whole city?  
\_\_\_\_\_
2. What is the amount that each company would need to charge to break even?  
\_\_\_\_\_
3. Compare your answers with the city with only one power company. What happened to the price that the customers would have to pay? What if customers were not willing to pay that much?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Why electricity might be a “natural” monopoly?  
\_\_\_\_\_  
\_\_\_\_\_

**Activity One (Version 2) Creating a Power Company in Your Classroom**

Imagine this class is a city with each desk as a house that needs electricity. To produce this electricity, the power company needs a power plant and power lines. The power lines must be connected to the power plant to work, but can go through other homes to make that connection. You are working for the power company to figure out how to make the city profitable.

Here are the prices and rules for the needed materials:

1. Building and operating a Power plant costs \$1,000.
2. Wiring a single house (desk) costs \$10.
3. Connecting a power line from one house to another costs \$5.

Now on your piece of graph paper, trace out of the layout of the desks/tables in the classroom. Figure out a strategy of where you will put your power plant(s) to be most efficient and how you will lay the power wires for your city (classroom).

Now, answer the following questions:

1. Based on your drawing, what is the total cost of providing electricity to your city?  
\_\_\_\_\_
2. How much will the power company need to charge each house (desk) in order to break even? \_\_\_\_\_

Now, imagine there were two power companies in the classroom. Answer the following questions:

1. What is the new total cost of providing electricity to the whole city?  
\_\_\_\_\_
2. What is the amount that each company would need to charge to break even?  
\_\_\_\_\_
3. Compare your answers with the city with only one power company. What happened to the price that the customers would have to pay? What if customers were not willing to pay that much?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Why electricity might be a “natural” monopoly?  
\_\_\_\_\_  
\_\_\_\_\_

**Activity One (Version 3) Creating a Power Company in Your Classroom**

Imagine this class is a city with each desk as a house that needs electricity. To produce this electricity, the power company needs a power plant and power lines. . Each power plant can power up to 40 homes (desks). The power lines must be connected to the power plant to work, but can go through other homes to make that connection. You are working for the power company to figure out how to make the city profitable.

Here are the prices and rules for the needed materials:

1. Building and operating a Power plant costs \$1,000.
2. One inch of power line costs \$1.
3. The power plant cannot be placed within 5 feet of a house (desk): this is because no one can live right next to a power plant.

Now, figure out a strategy of where you will put your power plant(s) to be most efficient and how you will lay the power wires for your city (classroom). Use the tape measure to calculate the total number of inches of wire needed to connect your whole city (classroom).

**Answer the following questions:**

1. Based on your layout and calculations, what is the total cost of providing electricity to your city? \_\_\_\_\_
2. How much will the power company need to charge each house (desk) in order to break even? \_\_\_\_\_

Now repeat the procedure but with TWO power companies. Remember: Each house must have electricity but will only buy electricity from ONE of the two companies.

3. What is the new total cost of providing electricity to the whole city?  
\_\_\_\_\_
4. What is the amount that each company would need to charge to break even?  
\_\_\_\_\_
5. Compare your answers with the city with only one power company. What happened to the price that the customers would have to pay? What if customers were not willing to pay that much?  
\_\_\_\_\_  
\_\_\_\_\_

6. Why electricity might be a “natural” monopoly?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 2:** What problems are caused by natural monopolies?

As we see, natural monopolies may be inevitable in some industries. However, natural monopolies pose many problems that economists seek to fix.

What do you think might be some problems posed by natural monopolies?  
(List at least 3.)

- Example: Less innovation due to lower competition

1.

2.

3.

Clearly, even though natural monopolies may be “natural”, many economists still do not consider them to be efficient or good for society. We cannot force them to have competitors, but there may be other things economists might recommend to address these problems. Therefore, let’s examine our final question...

**Question 3:** What are some possible solutions to the problems caused by natural monopolies?

Economists do not usually recommend letting monopolies roam free in the marketplace. What might you recommend to try to deal with the problems we discussed above? (List at least 3.)

- Example: Government provision of the good/service (Government owns and runs the power grid)
- 1.
- 2.
- 3.

### **Wrap Up Activity**

*Scenario:* Revisit activity one that you did earlier. Imagine there are three groups in that city: The power company's CEO and Shareholders, the Consumers in this city who use electricity, and the government (public utilities commission) of this city. Each group has its own objectives, and there is going to be a big public hearing to decide what to do in the electric industry. Both the power company and the consumers will get 3 minutes to lobby the government with what they want to happen. The government will then have to decide what to do, if anything, regarding the electric power in the city.

#### **You will be divided into three groups:**

- The power company's CEO and Shareholders
- Consumers in this city who use electricity
- The government (public utilities commission) of this city

#### **Discuss the following question(s) for each group inside the group:**

##### **Power Company CEO and Shareholders**

1. What are your main objectives?
2. How will you lobby the government and argue for your interests?

##### **Consumers in the City**

1. What are your main objectives?
2. How will you lobby the government and argue for your interests?

##### **Government**

1. What are your main objectives?
  2. How will you decide what to do with the electrical industry in your city?
- Once you have finished your discussion, choose one person to speak for the group.
  - First, the consumers' representative will have the opportunity to lobby the government for what they want. Then, the power company will have the opportunity to lobby. Then, the government will have a couple minutes to decide what to do.
  - Once the government group decides, they will announce their decision and reasoning to the rest of the class.

**Follow Up Homework**

Do an in-depth analysis of your local electric company via the internet and answer the following questions:

- a. How many electric companies are there in your area?
- b. Is electricity in your area a natural monopoly?
- c. Are electricity/power companies regulated in your area? If so, how? If not, why not?
- d. If you were the government, would you regulate the electric industry in your area? If so, how would you regulate? If not, why not?

**Challenge Questions:**

- e. Estimate how many miles of electrical wiring would be needed to service your area (your city? Or even just your street?) Remember, every house on every street needs access to the power line, so a way to do this might be to estimate the miles of roads in your city.
- f. Estimate the cost of wiring a full city (above ground lines cost \$10/ft, below ground is \$30/ft = assume \$20/ft).
- g. How might the cost you calculated affect the number of power companies in your area?