generate | derive | advantage | consume | contaminate

This week's issue: NUCLEAR POWER: OUR ENERGY FUTURE OR DANGER TO SOCIETY?

Pilgrim Nuclear Station sits just off the road 40 miles from Boston, Massachusetts. This power plant makes electricity by heating water with a controlled nuclear reaction. Boiling water makes steam. The steam turns a turbine to **generate** electricity. Power lines take electricity **derived** from the plant all over the state of Massachusetts.

Some politicians want to build more nuclear power plants like Pilgrim. They see nuclear power as a good alternative to expensive oil. Because we **consume** so much oil in America, we depend on oil from other countries. Nuclear power can be made in the United States, so nuclear energy cannot be cut off by another country. Nuclear power has another major **advantage**. It does not pollute the air like gas or coal does.

People who are concerned about nuclear power point to safety issues. Some nuclear power plants have leaked radioactive chemicals. The chemicals are blown by the wind and can **contaminate** water in nearby communities. Doctors have found higher rates of cancer in towns near the Pilgrim power plant.

The biggest worry about nuclear power is a meltdown. In a meltdown, the nuclear reaction gets out of control inside the plant. It gets so hot, the building explodes or breaks apart. Clouds of poisonous chemicals spread over a huge area. At Chernobyl, in Eastern Europe, a nuclear plant meltdown in 1986 spread contamination all over Europe. Thousands of people developed cancer after the meltdown. After the Chernobyl disaster, the U.S. stopped building new nuclear power plants.

Supporters of nuclear power believe that safer power plants can prevent these problems. They want the U.S. to start building nuclear power plants again. Is nuclear power worth the risks?

Questions for Classroom Discussion:

- How does a nuclear plant generate electricity?
- What are some ways we consume oil in the U.S.?
- What are two advantages of nuclear power?
- How can nuclear power be dangerous?
- What are some other ways we can derive the power we need for cars, electric lights, and heat?

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USE THE FOCUS WORDS

generate *(verb)* to produce

Sample Sentence: Boiling water makes steam, and steam turns the turbine to **generate** electricity.

Turn and Talk: What **generates** stress among young people in your community?

derive *(verb)* to come from; to obtain from

Sample Sentence: Her confidence is **derived** from years of playing sports.

Turn and Talk: From what do you **derive** happiness? I **derive** happiness from _____.

advantage *(noun)* quality that gives someone a better chance than others

Sample Sentence: One **advantage** of nuclear power is that it does not pollute the air like gas or coal.

Turn and Talk: What is one **advantage** of getting a good night's sleep?

consume *(verb)* to use up

Sample Sentence: Because we **consume** so much oil in America, we import oil from other countries.

Turn and Talk: What are some things you can do to reduce the amount of electricity you **consume**?

contaminate *(verb)* to poison; to pollute

Sample Sentence: If nuclear waste is not stored properly, it can **contaminate** soil and water.

Turn and Talk: What steps do doctors and nurses take to avoid **contaminating** patients?

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DO THE MATH

Americans **consume** more energy each year, and we are looking for cleaner, greener ways to produce it. Nuclear power has many **advantages**. It doesn't pollute the air, and it can be produced in the U.S. But nuclear opponents raise several concerns. One is nuclear waste. Nuclear waste **derives** from the nuclear reactions that create nuclear energy, as well as from the mining and enrichment of nuclear fuel. If nuclear waste is not stored properly, it can **contaminate** soil and water. Some nuclear waste will remain dangerous for thousands of years.

Yucca Mountain in Nevada has been proposed as a site for long-term storage of nuclear waste. But this has **generated** a lot of controversy. Many Nevada residents don't want a nuclear dump in their home state. In 2001, the Environmental Protection Agency set safety standards for Yucca Mountain for the next 10,000 years.

Option 1: The average American lives about 80 years. How many lifetimes is 10,000 years?

A. 125 lifetimes
B. 130 lifetimes
C. 135 lifetimes
D. 210 lifetimes

Option 2: An appeals court ruled that the 10,000-year safety standards for Yucca Mountain were inadequate. After all, some nuclear waste may be dangerous for hundreds of thousands of years. The new EPA safety standards cover the next million years. Write 10,000 and 1 million in scientific notation. How many orders of magnitude separate the two numbers?

10,000 = 10^4 and 1 million = 10^6. Two orders of magnitude separate the two numbers.

Discussion Question: With violence in the Middle East and worries about global warming, traditional energy sources like oil and coal are falling out of favor. The advantages of nuclear power seem increasingly appealing. Many experts say nuclear power is safe. They say that many of the fears people have about nuclear power derive from misinformation and from the confusion of nuclear power with nuclear weapons. But nuclear waste remains a problem. A long-term, ultra-secure facility is needed. But, given the fact that leaks could contaminate the local environment, no one wants this facility to be in his or her backyard. The Obama Administration cut government funding for the Yucca Mountain facility. Meanwhile, nuclear power plants continue to generate nuclear waste. Where should it go?

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THINK SCIENTIFICALLY

Ms. Kahn's class is discussing the connection between nuclear power plants and cancer.

"Cancer is a terrible disease," says Erin. "Many people suffer from cancer as a result of nuclear power plants **contaminating** their surroundings. That's why I don't think we should use nuclear energy."

"But think about all of the terrible pollution and political problems caused by other sources of energy," says Kristopher. "If there is a way that we can both **generate** clean energy and gain a political **advantage**, then I think we should consider it."

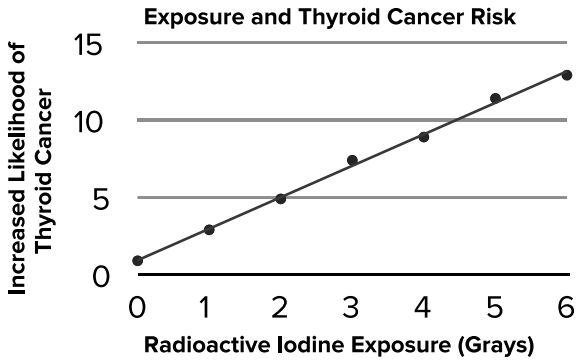
"Besides," suggests Lucinda, "cancer is a very complicated disease with many different causes. How sure are we that exposure to nuclear power plants really causes cancer?"

"That's a good question, Lucinda," says Ms. Kahn. "Let's take a look at the cancer rates around Chernobyl after the nuclear power plant accident there in 1986."

Ms. Kahn searched the internet and found the following information about some of the effects of the Chernobyl meltdown.

Thyroid Cancer Study Following the Chernobyl Accident in Ukraine:
The thyroid gland uses iodine to control how quickly your body uses energy and delivers important hormones to the rest of your body. However, when nuclear power plants melt down or just leak a little bit, they release a radioactive version of iodine into the environment that can get into the water and food supplies of the local community. When people **consume** these **contaminated** foods, their thyroids collect the radioactive iodine instead of regular iodine. This collection of radioactive material in the thyroid gland can cause thyroid cancer to develop, especially in children and adolescents.

After the Chernobyl meltdown in 1986, researchers began tracking over 13,000 children and adolescents who were exposed to high doses of radioactive iodine. They monitored the health of these young people over the next 25 years and found the following relationship between how much radioactive iodine they were exposed to and how likely they were to develop thyroid cancer.



Within this group of 13,000 people, scientists recorded three times as many incidents of thyroid cancer in comparison to a typical group of people who were not exposed to radioactive iodine.

Data Source: http://chernobyl.cancer.gov/studies.html

From these data, can you conclude that being exposed to radioactive iodine causes thyroid cancer in children and adolescents?

Yes, it increases the likelihood of cancer in children and adolescents.

If someone were exposed to 7 Grays of radioactive iodine, how many times more likely would they be to develop thyroid cancer?

Nearly 15 times more likely to develop thyroid cancer.

*Do you think this study is relevant to decisions about how we **generate** electricity in the United States? Explain.*

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DEBATE THE ISSUE

Pick one of these positions (or create your own).

A ❑ Nuclear power is too risky and should not be used.

OR

B ❑ The **advantages** of nuclear power are worth the risks.

OR

CREATE YOUR OWN ❑ _____

_____

_____

_____

_____

Jot down a few notes on how to support your position during a discussion or debate.

_____

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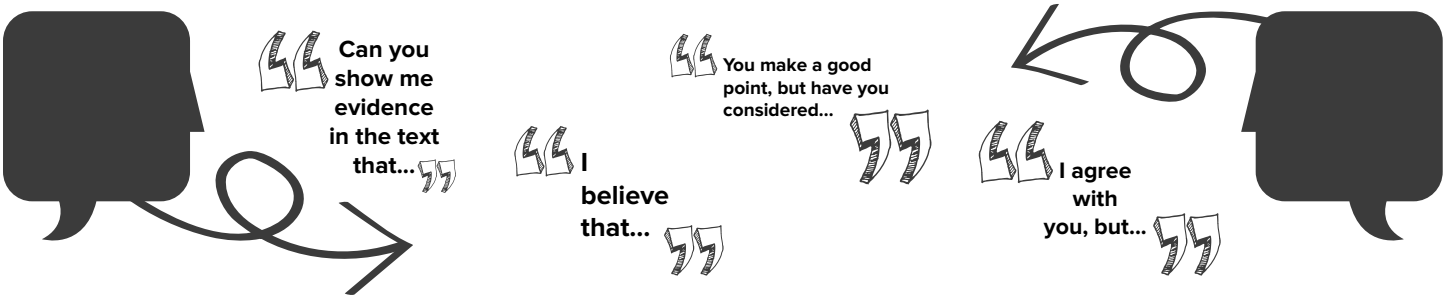
Be a strong participant by using phrases like these:



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TAKE A STAND

Support your position with clear reasons and specific examples. Try to use relevant words from the Word Generation list in your response.

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