**10 Pros & Cons of Nuclear Power** *By Joanna Burgess*

Link: <http://dsc.discovery.com/tv-shows/curiosity/topics/10-pros-cons-nuclear-power.htm>

**Other References:**

List of Pros & Cons:

<http://www.triplepundit.com/2009/02/nuclear-energy-pros-and-cons/>

The Pros and Cons of Nuclear Power:

<http://www.thedailygreen.com/environmental-news/latest/nuclear-power-pro-con>

Nuclear Power Pros And Cons: Is It Key To America's Energy Future?

<http://www.huffingtonpost.com/2010/11/15/the-case-for-and-against-_n_781567.html#s178811title=Con_Its_Safety>

The idea of an atom began with the Greek philosopher Democritus, who proclaimed all matter consisted of tiny particles. He called them ''atomos,'' the Greek word for ''indivisible.'' He couldn't prove they existed but centuries later other scientists did. That discovery heralded the nuclear power movement, which has been sparking controversy and debate ever since.

Proponents maintain that nuclear power is an economical, safe and clean form of energy. Critics cite industry disasters, problems of nuclear waste and links to chronic and sometimes fatal diseases. Massive anti-nuclear protests occurred throughout the '70s and '80s and have continued on a smaller scale into the 21st century. It is impossible for an issue of this magnitude to be cut and dried. Persuasive arguments can be made in favor of or against nuclear power. Here's s a list of 10 pros and cons that might help you navigate the debate.

A golfer tees off as steam rises from a nuclear plant near Limerick, Pa. Nuclear advocates insist the technology is clean and safe.

**Review as a class:**

10. Environmental Impact

There is no energy source that is 100 percent clean, but let's examine what nuclear power has going for it. Unlike fossil fuel plants, which spew tons of carbon dioxide into the atmosphere each year, nuclear power plants don't produce smoke. Electricity is created by splitting atoms in a series of nuclear reactions, otherwise known as nuclear fission. The iconic images of white plumes rising from cooling towers show nothing more than steam. Nuclear power is considered carbon-free and produces more electricity than other renewables like solar and wind.

Nuclear power is less clean before and after generating electricity. Nuclear power requires uranium, which must be mined and transported to power plants. The vast majority of the uranium used in the United States is imported [source: Energy Justice Network]. Then there is the significant issue of radioactive waste, which isn't biodegradable and is extremely dangerous. Most plants store nuclear waste in steel-lined concrete basins filled with water, where it remains radioactive for thousands of years.

Burial at Yucca Mountain

Yucca Mountain in Nevada has been proposed as a disposal site for 77,000 tons (70,000 metric tons) of nuclear waste. It's estimated that the waste will remain radioactive 10,000 years.

**Group 3:**

9. Support

The support for nuclear power ebbs and flows. There are 438 nuclear power plants operating in 2010. Another 61 plants are under construction [source: European Nuclear Society]. Many governments, including France and the United States, have embraced it, investing billions of dollars in the industry. In 2010 the U.S. Approved $55 billion in taxpayer-backed loans [source: Rogers]. While its use as a clean energy source is on the rise, the reality is that actual growth has been somewhat sluggish. In the United States, the last order for a new plant was placed in the 1970's [source: Energy Information Administration]. This is attributed to public concerns over health, environmental worries and fears about the security of nuclear facilities.

Russia Races Ahead

The world's first nuclear power plant, Russia's Obninsk AP-1, came on line in 1954.

8. Cost-effectiveness

The pro and con arguments over the cost and the economics of nuclear power are difficult to untangle. Ask 20 different experts and you will get 20 different answers.

Proponents of nuclear power often measure its economic prowess in kilowatts. Nuclear power plants produce more kilowatts than coal, wind or solar for fewer cents. As more plants are built, it's expected that construction costs will come down, making the price of nuclear-generated electricity that much more attractive [source: World Nuclear Association]. With construction comes jobs, something few could make a case against in the current economic climate.

Critics argue that the cost benefits aren't so clear-cut. While the electricity seems cheaper up front, the exorbitant costs of building and maintaining plants must be added into the equation -- something industry experts rarely do. Long-term storage of nuclear waste is expensive and dangerous. Next, add the expense of finding and retaining skilled labor. When it's all said and done, the claim that nuclear power is more cost effective than alternatives like wind, solar or even coal becomes a little more cloudy [source: ProCon].

China Leads the Way

In 2009 China became the dominant player in the clean energy movement. With a focus on wind farms, the country is currently the world's largest market for clean energy projects [source: Hargreaves].

7. Economics in Developing Nations

Millions of people in poorer countries have limited access to reliable sources of electricity. Up steps nuclear power to center stage. For starters, developing countries with nuclear power plants wouldn't have to rely on expensive fossil fuels that emit large volumes of carbon dioxide. Second, global interest in investing in nuclear power is high, providing the potential to pump money into emerging economies and create jobs. Proponents also maintain that many safety issues are solved using newer reactor technologies, reducing the likelihood of accidents [source: SciDev].

The economics arguments only go so far with critics. Many believe the push for nuclear power in developing nations has to do with money, not altruistic intentions. Blanket assumptions that expanding programs would boost economies and solve energy poverty doesn't account for each country's specific needs; issues like power grids, skilled labor and strong government policies differ among governments. Exorbitant construction costs may exceed a country's credit limit, pushing it deeper into debt [source: Bennett]. Developing nations will have to enforce strict safety standards and grapple with waste management. Concerns that radical governments might develop nuclear weapons runs deep [source: SciDev].

India's Goal for Nuclear Power

India hopes to produce 25 percent of its electricity from nuclear power by 2050 [source: World Nuclear Association].

**Group 2:**

6. Proliferation

The idea that a weapon could be made from stolen nuclear materials is ingrained into public consciousness. In theory, plants that enrich uranium for power could also be used to enrich it for bombs. Those that reprocess spent fuel (separating plutonium from uranium) could make stealing plutonium easier.

The hiccup in this theory is feasibility. A ''dirty bomb'' can be built with a relatively small amount of radioactive material but it would be incredibly difficult to obtain it from a nuclear power plant. A tremendous amount of money would be needed for training, bribes at borders and transportation. Detection is another issue. Lead shielding in a truck is required for uranium to slip through security detectors. Plutonium is much easier to detect even with a leaded lining [source: Rivero and Stanton]. In addition, heightened security awareness has tightened access to power plants.

The feasibility argument doesn't sway everyone. The expansion of nuclear power means that more plants would be reprocessing. This would increase the amount of available plutonium. Commercial plants have large stores of radioactive waste and keeping track of it is difficult. This contributes to the threat of theft or sabotage. Critics point to inadequate security regulations against terrorist attacks by aircraft, boats or trucks [source: Union of Concerned Scientists].

Reducing the Threat

The 1978 Nuclear Nonproliferation Act was written to reduce the threat of nuclear weapons development [source: Squassoni].

5. Reprocessing

Some scientists and industry experts look towards Integral Fast Reactors (IFR) as the solution to the problem of nuclear waste. In these plants, uranium and plutonium are separated or reprocessed, and the spent fuel is then used to power the reactor. Reprocessing doesn't eliminate nuclear waste but it does reduce both its volume and toxicity. In theory the waste has a much shorter half-life -- hundreds rather than thousands of years. Safety measures include a ''passive system'' that doesn't require a human operator to shut down operations in the case of malfunction [source: McCutcheon].

Skeptics of reprocessing maintain that IFRs and similar technologies are ''old nuclear wine in a new bottle.'' The time spent and extraordinary cost of building these types of plants will negate the benefits of any energy production, and nuclear waste is still nuclear waste, no matter how you slice it. The fact is plants are running out of storage room. The federal government is required by law to accept used reactor fuel, and the 2,000 tons of spent fuel produced each year put enormous stains on storage capabilities. In 2009 the Kewaunee nuclear power plant resorted to storing waste on its grounds close to Lake Michigan [source: Content].

4. Safety

Consumer confidence is key when marketing nuclear power as safe. The 1979 partial meltdown of a reactor at Three Mile Island and the Chernobyl disaster in 1986 gave critics explicit examples of the instability of nuclear power plants.

Proponents of nuclear power are steadfast in the belief that modern nuclear power plants pose no safety risk and are in fact safer than coal-burning plants. In the U.S. nuclear reactors are contained in concrete structures with walls four feet thick [Totty]. Three Mile Island and Chernobyl (which did not have concrete containment structures) were the only major accidents in ''14,000 cumulative reactor-years of commercial operation in 32 countries'' [World Nuclear Association]. However, this doesn't mean that accidents don't happen. Instances of radioactive water leeching into the ground have occurred. In one case, several million gallons of contaminated water reached drinking wells [Union of Concerned Scientists].

Did a Disaster Movie Foretell the Future?

"The China Syndrome" depicts the meltdown of the fictional Ventana nuclear power plant. It was released 12 days before the accident at Three Mile Island.

**Group 1:**

3. Impact on Wildlife

All forms of energy production impact the environment on some level. What are nuclear power's stats? Let's start by looking at an example of land usage. To generate the equivalent of a 1,000-megawatt plant, a single wind farm would require approximately 150,000 to 180,000 acres (61,000 to 73,000 hectares) of land; a solar photovoltaic park would use 54,000 acres (22,000 hectares). By comparison, a typical nuclear power plant uses 200-400 acres (81-162 hectares) [source: NEI]. However, the issue of waste might negate the land argument. Toxic by-products may make it impossible to reuse surrounding land when a plant is decommissioned.

Nuclear power plants also use large volumes of water for heating and cooling. One square mile (2.6 square kilometers) of water 14 feet (4.2 meters) deep goes through a typical two-unit reactor every day [source: Energy Justice Network]. Nuclear plants use preventative measures like stationary screens to prevent adult fish from being sucked into cooling water systems. But these don't help microscopic plankton, and larger animals like sea turtles and seals can become trapped against filters and drown [source: Energy Justice Network]. After-bays or cooling canals are used to minimize thermal pollution (heated water) from being discharged into surrounding bodies of water [source: NEI], but these systems don't filter heavy metals and salts [source: EPA].

Ecosystems and Habitats

The Wildlife Habitat Council (WHC) is a non-profit, non-lobbying environmental group helping nuclear facilities create and maintain clean habitats for animals and plants [source: WHC].

2. Health

The link between nuclear power and disease is complex. Hundreds of studies have been conducted. Their conflicting results make it difficult to separate fact from fiction, agendas from politics.

There's no debate that exposure to radiation can kill. But the connection between cancer and those living in the vicinity of nuclear power plants is arguable. Based on their studies, the U.S. Nuclear Regulatory Commission found no significant increase in cancer rates among adults and children residing in the 107 counties near nuclear facilities [source: NEI]. In 1990, the National Cancer Institute also reported a lack of data correlation between cancer and proximity to nuclear power plants [source: Berr]. Critics of these studies maintain there have been documented clusters of breast cancer and childhood leukemia near nuclear facilities. According to the Energy Justice Network, 268 counties within 50 miles of nuclear reactors had breast cancer death rates 10 times the national average [source: EJN].

1. The Fight Against Global warming

As heat waves, raging forest fires and devastating hurricanes become the norm, it's crystal clear that a solution to global warming must be found, and found fast. Is nuclear power the shining star? It all depends on whom you ask. One of the main arguments against nuclear energy is time. Plants take upwards of ten years to build but global warming is happening now. It won't wait around for new nuclear power plants to appear on the scene [Hertsgarrd]. Proponents argue that the amount of energy a nuclear power plant generates far outweighs the timeline issue. Megawatt for megawatt, it produces more clean energy than wind or solar once it's up and running.

The argument that nuclear power plants are more reliable is often cited. They aren't dependent on wind or sun to produce electricity. What isn't mentioned is their dependence upon is uranium. There is not an infinite supply of it and once it's gone, it's gone for good.

For more information on nuclear politics, policies and how it all works, visit the links on the next page.

A Growing Need: According to the International Energy Agency, the world demand for energy will grow 65 percent by 2020