

Nuclear Power: An Analysis of Its Environmental Impact

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The world faces gargantuan demand for energy, and enormous environmental side effects. Nuclear power is best posited to solve these problems.

It's hard to pick a single advantage of nuclear power when compared to other sources. It produces immense levels of electricity from very little material, is exceptionally reliable, and benefits the environment. Its environmental impact may be the most important. To establish nuclear power's environmental supremacy, I will analyze its competitors and then discuss its own properties.

First, renewable energy. It's odd to claim that "green" energy isn't really green, but it's true. Many mistakenly imagine wind turbines and solar panels surrounded by lush green grass and hopping bunnies or dancing fawns. While renewable sources are relatively benign *once in place*, their production is rather detrimental. Renewables require rare minerals. As Jason Hickel, an economic anthropologist and *Foreign Policy* contributor noted, "The transition to renewables is going to require a dramatic increase in the extraction of metals and rare-earth minerals, with real ecological and social costs." Mr. Hickel also noted that:

...this will exacerbate an already existing crisis of overextraction. Mining has become one of the biggest single drivers of deforestation, ecosystem collapse, and biodiversity loss around the world (2019).

A push for renewable energy isn't clean, contrary to popular belief.

Next, natural gas, a rapidly-growing electricity source. Natural gas gives off methane and carbon dioxide, a big negative for those worried about climate change. Also, fracking and wastewater disposal causes earthquakes (United States Geological Survey). Such quakes may lower property value.

Next, easily the worst energy source for the environment. Coal. Coal and its byproducts are detrimental to any location or living being in proximity. The U.S. Energy Information Administration noted:

Several principal emissions result from coal combustion:

Sulfur dioxide (SO₂), which contributes to acid rain and respiratory illnesses

Nitrogen oxides (NO_x), which contribute to smog and respiratory illnesses

Particulates, which contribute to smog, haze, and respiratory illnesses and lung disease

Carbon dioxide (CO₂), which is the primary greenhouse gas produced from burning fossil fuels (coal, oil, and natural gas)

Mercury and other heavy metals, which have been linked to both neurological and developmental damage in humans and other animals

Fly ash and bottom ash, which are residues created when power plants burn coal (2020).

Indeed, China's aggressive use of coal plants has contributed to over 300,000 deaths in 2013 alone, and coal-related health impacts will total \$38 billion per year (Layke, 2019). In many areas that use coal plants, smog and silt blanket the ground. As a nasty testament to coal, Beijing had to shut down many surrounding coal plants just so athletes could safely compete in the 2008 Olympic Games (Stewart 2008).

Coal production also produces enormous quantities of waste, which is stored in unlined landfills, contaminates drinking water, floods communities, or spills into rivers (Pierre-Louis, 2018).

So nuclear's competitors produce significant environmental harm. Some are worse than others - coal and natural gas definitely outrank small-scale solar, for example. But what about nuclear's impact?

Zero. Virtually zero emissions, damage, or waste. Let's look at each.

Except for the mining of the uranium, nuclear power is carbon-free. According to the Nuclear Energy Institute, "Nuclear...is the largest source of carbon-free electricity in the United States and protects our air quality by generating electricity without other harmful pollutants like nitrogen oxide, sulfur dioxide, particulate matter or mercury (2020)." General Electric Hitachi Nuclear Energy also confirmed this point: "...nuclear plants help protect air quality and mitigate climate change (2020)."

The direct environmental damage component is where anti-nuclear advocates start screaming. "Chernobyl! What about Fukushima and Three-Mile-Island?" Although this is an extremely complex issue that could warrant a book's-worth of discussion, it suffices to say that *if properly maintained and operated, nuclear power is perfectly safe*. This is even more true regarding new Small Modular Reactors or "pebble-bed" units. Many objections to nuclear power, such as that plants can blow up like atomic bombs, or every plant is a Chernobyl about to happen, etc., are patently false. And although nuclear power can have devastating consequences if misused or operators take shortcuts, properly handled reactors are the safest energy source we have. The Nuclear Energy Institute put it well when it said: "Is nuclear energy safe? The answer is unequivocally yes (2020)." Many nuclear "accidents" were the result of dumb operators, not inherent weaknesses of nuclear power.

Last, I discuss nuclear waste. Again, many discussions and books have been devoted to this topic. Some even commit their lives to solving this problem! In short, the "threat" of nuclear waste is grossly exaggerated. It is already feasible to store nuclear waste without harm to existing or future generations. The World Nuclear Association noted:

The popular misconception is that because certain parts of nuclear waste remain radioactive for billions of years, then the threat must be sustained for that period. However, this is not the case. Whilst remaining weakly radioactive for a few hundred thousand years, the radioactivity from the main component of the waste which could cause health problems will have decayed to safe levels within a few hundred years (2020).

The Nuclear Energy Institute also point out that:

All of the used fuel ever produced by the commercial nuclear industry since the late 1950s would cover a football field to a depth of less than 10 yards. That might seem like a lot, but coal plants generate that same amount of waste every hour (2020).

From the Yucca Mountain project, the WIPP, the Holtec Andrews, Texas project, the 32N164W

proposal, to the Finnish waste facility, numerous options for storing nuclear waste exist.

To conclude, all of nuclear power's competitors have substantial environmental drawbacks. Nuclear power, however, has *zero* (provided it is run properly, of course). Although nuclear power has several solid advantages, the environmental one may prove most significant. If one is worried about global warming, or if one lives near a plant, or if China wishes to save hundreds of thousands of people, nuclear is the solution.

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