A Green Energy Future
Without Expanding Nuclear

After decades of decline, politicians are considering nuclear power as a possible contender in the energy future of the United States. But nuclear power is costly, poses unnecessary safety and environmental risks, is heavily dependent on taxpayer and ratepayer subsidies, and generates deadly radioactive waste. Building new nuclear power plants will not effectively address climate change. Clean, safe, renewable energy sources can reliably generate as much energy as conventional fuels without significant carbon emissions, destructive mining or the production of radioactive waste.

Climate change is a serious problem, and in the past few years, public support for solving the climate change crisis has grown. Increased public understanding of the negative impacts of carbon pollutants has created an opportunity for the dormant nuclear industry to rebrand itself as the "clean" alternative to fossil fuels. Despite the 2011 disaster at the Fukushima Daiichi Nuclear Power Plant in Japan, a new image, combined with 30 years distance from the partial meltdown at Three Mile Island in Pennsylvania, has positioned the nuclear industry for wider public acceptance.

However, myths remain. Nuclear power is not any cleaner or cheaper today than it was in 1973, when construction began on the Watts Barr reactor in Tennessee, the last reactor commissioned.

Tyson Slocum
Public Citizen

Clean, safe, renewable energy sources can reliably generate as much energy as conventional fuels without significant carbon emissions, destructive mining or the production of radioactive waste.

Myth 1: "Too Cheap to Meter"

Despite the promise nuclear proponents made more than 50 years ago that nuclear energy would be "too cheap to meter," the nuclear power industry continues to depend on taxpayer handouts to survive. Since its inception in 1948, the industry has received more than $145 billion in federal subsidies but remains unable to compete economically on its own.[1]

For instance, the industry could not survive without placing all the risk for new reactors on the shoulders of taxpayers via the Price-Anderson Act. An accident at a nuclear reactor could cost more than $600 billion, a financial risk no corporation would be willing to accept. Under this law, an operator's liability is capped at $10.5 billion.[2] Taxpayers would pick up the difference.

There is also the promise of loan guarantees that industry lobbyists secured in the Energy Policy Act of 2005. Under the program, the federal government promises to pay back loans used to build reactors in the event the builder defaults. Although initially designed to back "innovative energy technologies such as renewable wind and solar power," much of the money likely will be used to financially prop up nuclear reactors.

Using taxpayer money to financially back nuclear reactors puts taxpayers at a huge risk. The risk of default on loan guarantees for new nuclear plants is projected to "very high, well above 50 percent"[3]—not good odds for taxpayers. In fact, without the promise of loan guarantees, it's unlikely an energy company could secure a loan to build a new reactor, which can cost upwards of $10 billion.

Even with the subsidies, loan guarantees and limits on liability, some investors recognize that nuclear energy doesn't make financial sense. Early in 2008, financier Warren Buffett ended his pursuit of a nuclear power plant in Idaho after spending $10 million to evaluate the idea. Buffett's company, MidAmerican Energy, decided the numbers didn't add up to make the project viable.

Myth 2: "Environmentally Friendly"

The money Congress is still providing for the industry and the renewed interest in nuclear energy is based on the premise that relying on "low-emission" reactors will somehow address the global warming crisis because nuclear power is "environmentally friendly."

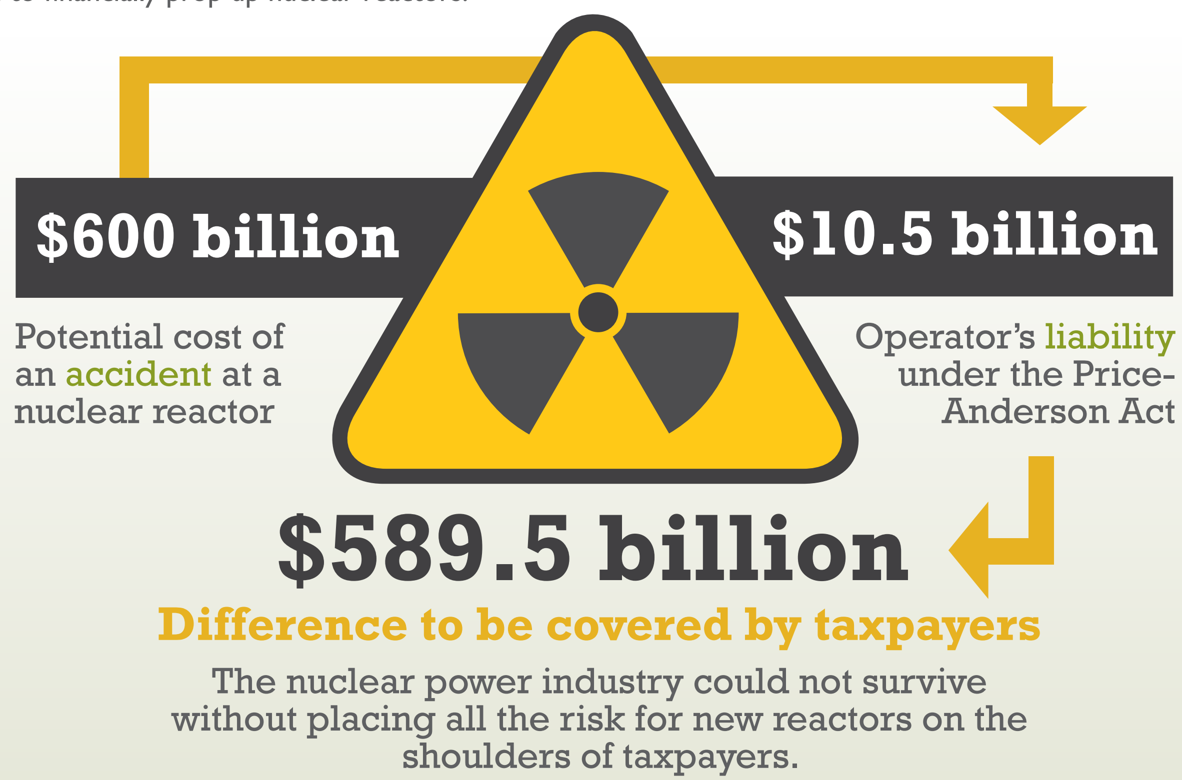
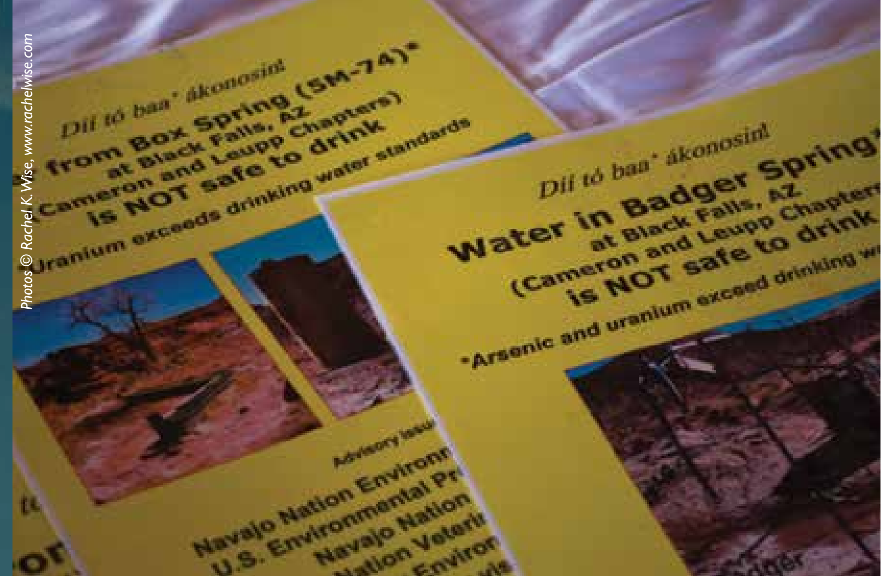


Photo courtesy Debra White Plume and Bring Back the Way www.bringbacktheway.com

The uranium deposit at Crow Butte in Nebraska was discovered in 1980. Now much of the region is contaminated.



Photos © Rachel K. Wise, www.rachelwise.com

People of the Navajo Nation gather for a community meeting to discuss the water contamination problems in their area.

Photos © Rachel K. Wise, www.rachelwise.com

Photos © Rachel K. Wise, www.rachelwise.com

Residents collect water from their local spring, which is not fit for drinking because of uranium contamination from years of mining run-off.

During a 30-year period beginning in the 1950s, 3,000 members of the Navajo Nation worked in uranium mines; the consequences were devastating.

Thousands of uranium miners and their relatives lost their lives as a result of radioactive contamination.

Uranium mining on tribal lands continues today and Native communities continue to be exposed to the resulting pollution. Along with existing mines, abandoned and exploratory mines discharge radioactive waste into the groundwater, rivers and streams, that native people rely on.

Conventional uranium mining has caused dust and radon inhalation by workers, resulting in high rates of lung cancer and other diseases, and mining has caused serious contamination of groundwater.

Contrary to what the industry and its lobbyists want you to believe, nuclear power pollutes. Uranium, a finite resource like coal, fuels nuclear power. The process of mining, milling and enriching uranium produces radioactive waste and presents opportunities to contaminate soil, air and water. Uranium is mined by removing uranium ore or by extracting the uranium in a newer process known as in situ leaching. Most uranium mining in the United States takes place in Utah, Colorado, New Mexico, Arizona and Wyoming, and these areas of the

from the editor

Alternative Fuels: Focusing on Smart Solutions

In our search for better, cleaner and more sustainable energy sources, we need to focus on the right solutions. Nearly all energy solutions carry inherent risk if not done correctly. Rather than promoting and subsidizing dangerous options, we need to make an unprecedented commitment to substantially increase energy efficiency in vehicles, homes, and factories and support clean, equitable sources of energy, such as solar and wind power. Here are just a few energy sources currently in use and under consideration.

Fuel	Potential Benefits	Dangers	Implications	Smart Alternatives
Natural Gas	Domestic fuel source Cleaner than other fossil fuels Efficient fuel source	"Fracking" (hydraulic fracturing) is used in 90 percent of drilling Drilling companies are exempt from the Safe Drinking Water Act[1]	Air, ground-water and well pollution Requires hundreds of toxic chemicals Each well uses millions of gallons of water	Regulation that prevents damage to the environment Require the gas industry to be accountable to the Safe Drinking Water Act
Corn-Based Ethanol	Domestic fuel source Renewable resource	Requires as much energy to produce than it generates when burned Soil erosion and water pollution from use of chemical fertilizers and pesticides	Maximum potential is only 12% of current US gasoline usage Expensive: anticipated cost to US tax payers is between $5.5 and $7.3 billion annually[2] Global food insecurity	Other forms of ethanol such as cellusosic which is derived from sugar cane waste, switch grass and other sustainable sources
Biomass	Domestic fuel source	Deforestation Now counted as carbon-neutral but could increase CO2 emissions substantially	Alters biodiversity, regional weather patterns, land use	Use sources that avoid deforestation such as switch grass, salvaged wood waste
Nuclear	Domestic fuel source Cleaner than other fuel sources	Requires uranium Processing results in radioactive waste	Groundwater, soil and air contamination from mining Mining is detrimental to the health of native communities Financially unsustainable: industry is subsidized by US government Radioactive waste leaks and spills	Renewable energy sources

Photo courtesy Tom Till Photography, www.tomtill.com

An aerial photo of the former Atlas tailings pile, lower right, next to the Colorado River near Moab, Utah. Tailings are often abandoned above ground and due to the proximity to the river, communities downstream are threatened with contamination.

country are now suffering from its effects. Conventional uranium mining has caused dust and radon inhalation by workers, resulting in high rates of lung cancer and other respiratory diseases, and mining has caused serious contamination of groundwater.

When conventionally mined, uranium metal must be separated from the rock in a process called milling, which forms large radon-contaminated piles of material known as tailings. These tailings are often abandoned aboveground. Twelve million tons of tailings are piled along the Colorado River near Moab, Utah, threatening communities downstream. In the process of in situ leaching, a solution is pumped into the ground to dissolve the uranium. When the mixture is returned to the surface, the uranium is separated and evaporated in slurry pools, and the remaining contaminated water has potential to seep underground and mix with drinking water sources.

Uranium mining has historically threatened the health and safety of tribal communities and continues to do so. A uranium mine in Nebraska has the Oglala Sioux Tribe concerned about the drinking water contamination. "Geo-chemically changed" contaminated water from the mining process is suspected of flowing into drinking-water aquifers.[4] During a 30-year period beginning in the 1950s, 3,000 members of the Navajo Nation worked in uranium mines, often walking home in ore-covered clothes. The consequences were devastating. Thousands of uranium miners and their relatives lost their lives as a result of radioactive contamination, and many families are still seeking compensation.[5]

In addition to the immediate effects, no country has found a permanent solution for the high- and low-level radioactive waste that nuclear energy creates. Generated throughout all parts of the fuel cycle, this waste poses a serious danger to human health. Currently, more than 2,000 metric tons of high-level radioactive waste and 12 million cubic feet of low-level radioactive waste are produced annually by the 103 operating reactors in the US.[6] This deadly waste, which is so radioactive it can't be moved for years, sits in more than 100 US facilities because there is nowhere to store it safely. Already, more than 54,000 metric tons of irradiated fuel has accumulated at the sites of commercial nuclear reactors in the US.[7]

Photo courtesy US Navy photo by Mass Communication Specialist 3rd Class Dylan McCord

An aerial view of damage to Sukuiso, Japan, a week after a 9.0 magnitude earthquake and subsequent tsunami devastated the region.

When an earthquake and tsunami caused explosions and nuclear reactor meltdowns at Fukushima Nuclear Power Plant on March 11, 2011, more than 1,600 plant workers were exposed to dangerous levels of radiation. Hundreds of thousands of residents were evacuated and tens of the thousands will never return to their homes. In the months following the incident, high levels of radioactive chemicals were found in food products from the area such as beef, tea, milk, seafood and many vegetables, which have since been recalled. High levels of radiation are suspected at elementary schools dozens of miles of way from the plant. Experts say it could take decades to clean up the area.[1]

Photo courtesy Derek Visser

Smoke at Fukushima-Daiichi nuclear power plant.

Photo courtesy Steve Herman

The Yamagata family has to deal with the damage done to their pharmacy along with concerns of radiation contamination after the 9.0 earthquake.

In response to the nuclear crisis in Japan, 250,000 people took to the streets demanding an end to nuclear power in Germany where 17 reactors provide 23 percent of the nation's energy. Under the enormous public pressure, the German government announced that all nuclear power plants would close and be replaced by wind and solar energy by 2022.[2]

Photo courtesy Cschirp

Start of the street protest against nuclear power in Essen Germany, April 2, 2011.

Trading one dirty energy source for another is not the only option. We don't have to choose between coal and nuclear.

The Answer

Trading one dirty energy source for another is not the only option. We don't have to choose between coal and nuclear. Renewable energy sources such as wind, solar and geothermal, along with increased energy efficiency, are better alternatives to meeting our energy needs than either coal or nuclear. It is technically and economically feasible to completely meet the energy needs of the US over the coming decades with them.[8]

Researchers at Stanford University recently evaluated the potential of wind power globally. After analyzing wind speeds in various locations around the world, the researchers concluded that wind could generate about one and a half times current annual world energy use.[9]

Existing solar electric technology could also make a significant contribution to energy production. According to a recent study, the US could accommodate about 1 million megawatts of photovoltaic (PV) panels by 2025, which would generate approximately half of current US electricity use.[10] With improvements in panel efficiency, the total long-term technical potential of solar PV in the US could provide more than three times current world energy use, according to a National Renewable Energy Laboratory analysis.[11]

Furthermore, a recent report out of Duke University by John Blackburn, professor emeritus, suggests that nuclear may be overtaking solar energy in its cost per kilowatt hour. The report, *Solar and Nuclear Costs: The Historic Crossover*, examines North Carolina's future energy costs using solar and nuclear sources. Their findings show that, at 16 cents per kilowatt-hour, solar energy becomes more affordable and a better investment. Nuclear plants take years to build, often with great delays. If solar energy can gain the same financial traction currently held by the nuclear industry, it will only become more financially accessible as demand grows.[12]

In addition to renewable technologies, using energy more efficiently is an important part of moving to a clean energy future. Efficiency is the cheapest and easiest way to reduce electricity use and facilitate the transition to renewable technologies.

Renewable energy opponents argue that renewable energy is far too variable and inconsistent to meet our energy needs because of weather conditions and natural cycles of availability. But a recent analysis by the International Energy Agency concluded that intermittency is not a technical barrier to renewable energy. Distributed generation, links across geographic areas, a diverse mix of technologies harnessing different resources and the continued development of storage technologies are potential solutions.[13] Renewable technology growth is steadily increasing its portion of the US energy portfolio. For instance, wind energy contributed up to 39 percent of all new US electric generating capacity in 2009.[14]

When you add up the safety and security risks, financial implications for taxpayers and environmental and community impact potentials, it is clear that nuclear power is not the answer to our future energy needs. It is time for a renewable energy revolution—one that is clean, secure, cost-effective and that will create the jobs and stability that we need.

.....

Tyson Slocum is director of Public Citizen's (www.citizen.org) Energy Program, where he promotes decentralized, sustainable energy and affordable clean-energy solutions. He also works to highlight the significant financial costs and safety risks associated with nuclear power and advocates legislative efforts to address climate change. In addition, Slocum serves on the Commodity Futures Trading Commission's Energy and Environmental Markets Advisory Committee. Prior to joining Public Citizen, Slocum was a policy analyst at the Institute on Taxation and Economic Policy. He received his BA from the University of Texas at Austin and grew up in Newport, Rhode Island.

A Blueprint for a Clean Energy Economy

Reducing oil dependence. Strengthening energy security. Creating jobs. Tackling global warming. Addressing air pollution. Improving our health. These are just a few of the many reasons for the United States to move to a clean-energy economy, one that does not depend on oil, does not contribute to global warming and invests in technologies that will spur American innovation and entrepreneurship, create jobs and keep the US globally competitive. The transition to a clean-energy economy is under way, but the changes are still too gradual to reduce heat-trapping emissions sufficiently to protect the well being of our citizens and the health of our environment.

Recent analyses by the Union of Concerned Scientists (UCS) and other experts indicate that, even with aggressive action by other nations, the US must reduce its emissions by at least 80 percent below 2005 levels by 2050 to have a reasonable chance of avoiding some of the worst impacts of climate change. UCS has developed a comprehensive blueprint for the way forward. It shows that we can lower US heat-trapping emissions to meet a carbon limit set at 26 percent below 2005 levels in 2020, and 56 percent below 2005 levels in 2030. This would put us on track to meet the 80 percent target by 2050 while saving businesses and consumers money.

The UCS blueprint is made up of many different building blocks. Some of the policies are already in place in some form, but need to be strengthened, others are in active

Kevin Knobloch,
Union of Concerned Scientists