

Want zero carbon emissions? Go nuclear, economics professor says

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“In our analysis, which is a pretty sophisticated economic model, we are saying that nuclear might be quite good until we find cheaper alternatives,” says Ujjayant Chakravorty. Credit: Kelvin Ma

(Phys.org)—Nuclear power often inspires fear and loathing, no more so than among environmentalists, who have long decried the potential dangers and the still-unsolved problem of what to do with nuclear waste. Consumers have their doubts as well. The memory of major accidents such as those at Chernobyl, Three Mile Island and, most recently,

Fukushima Daiichi in Japan leaves many regular folks cringing at the prospect of relying on nuclear energy to light and heat their homes.

But [climate change](#) has caused even some of the most ardent foes to reconsider: unlike oil, natural gas and coal, [nuclear plants](#) don't emit [greenhouse gases](#). And [nuclear technology](#) continues to improve, making plants cheaper to build and safer to operate, all of which leaves a potential opening for this long-spurned energy source.

Ujjayant Chakravorty, a professor of economics in the School of Arts and Sciences, is an expert on energy economics, and last year co-authored an article with two European researchers in the Journal of Public Economic Theory exploring the question of using nuclear energy to promote climate stabilization.

Tufts Now: What's the best form of clean energy?

Ujjayant Chakravorty: As economists, we always say there's no such thing as a free lunch. If you want clean energy, something has to give. Solar power and [wind turbines](#) are expensive and are not completely free of problems. Drive around a wind power facility, and it's noisy; plus birds are killed when they collide with the turbines. Right now wind and solar provide only about 1 percent of the [global energy](#) supply.

[Hydropower](#) has major environmental impacts. The big concern in New Zealand, which relies on hydropower, is the impact on its rivers and mountains; people there fear it is destroying the ecosystem. China's Three Gorges Dam, the world's largest hydropower project, displaced more than a million people and caused environmental problems..

So what's the best way to cope with climate change?

We will need many options. One technology won't be the solution. In our

analysis, which is a pretty sophisticated economic model, we are saying that nuclear might be quite good until we find cheaper alternatives.

What are the advantages of nuclear power?

If you look at where base load power comes from—the least amount of energy we need to provide power—you need a major source, something that is non-stop. Nuclear provides non-stop generation. It's not like depending on sun or wind. Nuclear plants are available day in and day out, and they don't emit greenhouse gases.

How about the dangers?

If you look at the history of nuclear energy, people are afraid of the big catastrophe situations like Chernobyl or Fukushima, which was affected by an earthquake and tsunami. But these plants didn't have engineering failures. What happened at Chernobyl was a case of mismanagement. People get complacent, the work gets routine, and they take shortcuts. In Japan, the nuclear plant was old and was supposed to be decommissioned. It was a perfect storm, in a sense. It was not that the plant collapsed—it shouldn't have been operating under those circumstances in the first place. So it was not a technological problem, but lack of proper care.

How do you deal with human failure at nuclear plants?

There are some new reactor designs that can prevent the inner core from melting and causing large-scale damage, but human failure remains a relevant issue.

How much is nuclear power relied on around the

world now?

The nuclear industry has been strong for many decades. Nuclear capacity has increased in the United States and continues to increase around the world, largely because of enhanced efficiency and less down time spent on maintenance. We have about 110 nuclear power plants in the United States, and 16 more are in various stages of design or approval.

Worldwide, in the past four decades, it's been growing at 12 percent a year, which is significant annual growth.

Isn't Germany ending its use of nuclear power?

Germany will abandon its nuclear plants by 2036, and is already planning to build more coal-fired plants to make up the deficit. Germany currently gets about 17 percent of its electricity from nuclear, but France gets about 80 percent from it. That keeps French carbon emissions down.

How do we safely dispose of nuclear waste from power plants?

This problem has not yet been solved, and yes, it's an issue, involving not only technology but also politics. But if you put the waste down deep enough, technically it can stay there safely. But there are other ideas, too. In our paper, we investigated plants where they are able to remove plutonium waste and re-use it. There are 20 pilot plants like this in the world that can recycle the waste. It's experimental, but many scientists think this is one way to go. Nuclear technology is not static, and there are various measures to take care of problems; if we don't build new plants the technology will not evolve. Newer plants are much safer than older plants.

Aren't nuclear plants expensive?

Yes, it is expensive to build nuclear plants, about \$10 billion per plant, and there is concern about liability, so the government essentially has to buy insurance for companies to build these plants. However, once you build it, the plant goes on and on. Some plants in the United States run for about 40 years and are licensed again and can run for another 40 years, so they can operate for a huge amount of time.

Provided by Tufts University

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