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Union of Concerned Scientists Backgrounder

Rising Temperatures Undermine Nuclear Power's Promise

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There are a number of reasons why nuclear power currently is not a viable solution for global warming. Among others, nuclear plants are uneconomical, unsafe and a potential target for terrorists. Further, they generate waste that will stay radioactive for hundreds of thousands of years, and there is still no place to dispose of it.

But another argument against building new nuclear power plants to combat global warming may be global warming itself.

As global warming pushes temperatures upward, scientists project increased heat waves and drought in the United States, Europe and elsewhere. Such conditions spell trouble for nuclear power plants. The water they rely on from lakes and rivers to cool reactors during the summer are either drying up or too warm to use.

On August 16, the Tennessee Valley Authority (TVA) had to shut down one of the three units at its Browns Ferry nuclear power plant because the Tennessee River water it uses to cool the reactor was too hot, exceeding a 90-degree average over 24 hours. The two other reactors at the plant had to run at reduced capacity.

The same day, demand for TVA power set a record, presumably due in large part to the increased use of air conditioning. The average high temperature for five of the largest cities in TVA's service area, including Memphis and Nashville, was 105 degrees.

There were similar incidents in the summer of 2006. In August, for example, Exelon had to cut power at its Quad Cities, Illinois, nuclear power plant after a heat wave warmed the Mississippi River. Other plants in Illinois and some in Minnesota had to cut power due to drought.

An extended heat wave last summer in Europe also intensified drought conditions, lowering water levels in the lakes and rivers that nuclear plants rely on for their water supply. French, Spanish and German utility companies had to shut down some of their plants and reduce power at others. Several Western European governments exempted nuclear plants from regulations against discharging overheated water into waterways.

The situation in Europe was even worse during the summer of 2003. An unprecedented heat wave forced France to shut down a quarter of its 58 nuclear power plants.

"Nuclear plants as they're designed now will produce less power in a warming world," said Dave Lochbaum, the Union of Concerned Scientists'

nuclear safety project director. "The industry can't use global warming as a justification for building more plants without papering over the fact that they don't do well in extremely hot weather."

Nuclear power plants split atoms to produce heat to boil water, Lochbaum explained. The resulting steam spins turbines that produce electricity.
After the steam exits the turbine, a large amount of water drawn from a nearby lake or river is used to cool it down so it can be recycled to make steam again. The plants discharge the water from the lake or river back into the same water body, but the process warms it as much as 30 degrees higher than it was originally.

Hotter weather disrupts this cycle. When river or lake water temperatures rise from 70 degrees to 90 degrees, for example, a nuclear power plant's electrical output is reduced nearly 5 percent. Higher water temperatures can impair the ability to cool down the steam to a point where a reactor must be shut down.

Meanwhile, electricity demand spikes when temperatures rise, putting more strain on the grid. Safety equipment also can be compromised when temperatures go up. A reactor at the Donald C. Cook nuclear plant in Michigan, for example, was forced to shut down in July 2006 because of temperature-related safety concerns.

"If average global temperatures continue to rise, as climate scientists predict, the nuclear industry will literally be in hot water," Lochbaum said. "It really makes no sense to spend billions of federal dollars to build new nuclear power plants until we solve the climate crisis. That means we should be betting on conservation, energy efficiency, and solar and wind power, none of which rely on water."

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Formed in 1969, the Union of Concerned Scientists is the leading science-based nonprofit organization working for a healthy environment and a safer world. UCS has offices in Cambridge, Massachusetts; Berkeley, California; and Washington, D.C. For more information, go to www.ucsusa.org.

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