

Plutonium or greenhouse gases? Weighing the energy options

Can nuclear energy save us from global warming? Perhaps, but the tradeoffs involved are sobering: thousands of metric tons of nuclear waste generated each year and a greatly increased risk of nuclear weapons proliferation or diversion of nuclear material into terrorists' hands.

So concludes University of Michigan professor Rodney Ewing, who has analyzed just how much nuclear power would need to be produced to significantly reduce greenhouse gas emissions worldwide, and the implications of the associated increase in nuclear power plants. Ewing will present his findings Oct. 23 as the Michel T. Halbouty Distinguished Lecturer at the annual meeting of the Geological Society of America in Philadelphia.

"Usually when people talk about nuclear power as a solution for global warming, the issues of nuclear waste and weapons proliferation are footnotes in the discussion," said Ewing, who is the Donald R. Peacor Collegiate Professor and Chair in the U-M Department of Geological Sciences and also has faculty appointments in the departments of Nuclear Engineering & Radiological Sciences and Materials Science & Engineering. "I think we have to find a way to consider the complete picture when choosing among energy sources."

In an effort to capture that complete picture, Ewing compared carbon-based fossil fuels with nuclear power, considering not only the technologies involved but also the environmental impacts. Similar comparisons have been made between different energy-producing systems, "but in the case of nuclear power, such an analysis is difficult because there are different types of nuclear reactors and there is not a single nuclear fuel cycle, but rather many variants, with different strategies for reprocessing and disposing of nuclear wastes," Ewing said.

His presentation, which considers various fuel cycles, shows that nuclear power generation would need to increase by a factor of three to ten over current levels to have a significant impact on greenhouse gas emissions. "We currently have 400-plus nuclear reactors operating worldwide, and we would need something like 3,500 nuclear power plants," Ewing said.

Developing the necessary nuclear technologies and building the additional power plants is an enormous undertaking that probably would take longer than the 50 years that experts say we have in which to come up with solutions to global warming, Ewing said.

Even if they could be built and brought online quickly, that many power plants would generate tens of thousands of metric tons of additional nuclear waste annually. "The amount that would be created each year would be equal to the present capacity anticipated at the repository at Yucca Mountain," Ewing said, referring to the proposed disposal site in Nevada that has been under study for more than two decades. Ewing recently co-edited a book, "Uncertainty Underground," that reviews uncertainties in the analysis of the long-term performance of the Yucca Mountain repository.

Plutonium created as a byproduct of nuclear power generation also is a concern because of its potential for use in nuclear weapons.

"Not everyone thinks this way, but I consider the explosion of a nuclear weapon to be a pretty large environmental impact with global implications," Ewing said. "A typical nuclear weapon will kill many, many hundreds of thousands of people, and the global impact would be comparable to something like Chernobyl in the spread of fallout."

So the real question, said Ewing, is: "Plutonium versus carbon---which would you rather have as your problem? I don't have the answer, but the points I'm raising are ones I think people need to be considering."

Source: University of Michigan

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