

Cool Geo-Whiz Warming Ideas

More scientists are thinking outside the box on global warming-way outside

By Bret Schulte

Posted Sunday, October 15, 2006

Ken Caldeira has a big idea. Really big. At a grim Washington conference on the melting Arctic, the acclaimed global ecologist took the stage not to spell out the effects of global warming but to prescribe a way of "fixing" them.

Caldeira says it's possible to halt the Arctic melt by regularly spraying sulfates into the stratosphere over the North Pole that would deflect anywhere from 10 to 20 percent of the sun's rays over the region-enough to cool the polar cap down so that ice could rebuild to preindustrial levels. "This is the kind of thing that is technically feasible," Caldeira announced.

Really? Once dismissed as wacky, dangerous, or outright impossible, radical geoengineering schemes like Caldeira's are garnering serious consideration from many of the world's most eminent scientists. The impetus: "predictions that we are heading toward catastrophe," says John Latham of the National Center for Atmospheric Research. Latham and others say "sci-fi"-sounding solutions shouldn't replace efforts to cut harmful emissions. But scientists increasingly believe that transforming the world's energy system from fossil fuels to clean energy is a staggering task that will require decades of work and trillions of dollars. The idea behind geoengineering "is to hold the Earth's temperature constant as kind of a stopgap to buy us some time," Latham says.

Crisis. The concept got a boost in August when Ralph Cicerone, president of the National Academy of Sciences, published an essay supporting research, noting that the demand for geoengineering ideas will grow as the global warming crisis deepens. Research now will allow "dangerous ideas to be seen as such and meritorious ones to develop further."

The hubbub over geoengineering comes as the Bush administration released a report last month outlining the White House's principal strategy in the fight against global warming: research on new technology. Three years overdue, the 244-page "Climate Change Technology Program Strategic Plan" touts \$29 billion in government programs that include tax credits for hybrid vehicles, energy efficiency mandates for appliances, support for renewable fuels, capturing and storing carbon in geologic formations, and \$1 billion for the FutureGen program-a government-industry collaboration to build the world's first coal-fired power plant that is nearly emission free. In testimony before the

House Subcommittee on Energy, the program's director, Stephen Eule, hailed the report as a key element of President Bush's "robust and flexible climate change policy."

But upon its release, the report was widely derided by critics, including many congressional Republicans, as being too little, too late. "What we essentially got was an inventory of things as they are now rather than a strategic plan for the future," says Republican Rep. Sherwood Boehlert, chair of the House Science Committee. Rep. Tom Davis, who heads the House Government Reform Committee, blasted the program as a paper tiger, saying it lacks a full-time director or any budgetary authority, noting that nearly all of the billions of dollars cited in the report are controlled by other agencies, like the Department of Energy. So the program has little power, Davis says, to coordinate and implement plans to bring technologies to market. In his opening statement at a CCTP hearing last month, Davis also noted, "Climate solutions that lie outside of existing technology, such as geoengineering ... remain unaddressed."

Page 2 of 2

A number of scientists are practically knocking down the door with geoengineering solutions. Advancing an idea once worked on by the father of the hydrogen bomb, Edward Teller, atmospheric scientist and Nobel Prize-winner Paul Crutzen believes Earth's temperature could be quickly brought down by spraying pollution into the atmosphere on a global scale. He issued a paper earlier this year pointing out that heavy artillery could fire rockets into the stratosphere. Once there, emissions from a special fuel would convert into sunlight-reflecting sulfate particles.

Latham has his own plan: a fleet of unmanned vessels, powered mostly by wind, that skim the ocean surface spraying salt water into clouds to enhance their reflectivity. Another suggestion is a balloon-suspended tube, or chimney, perhaps 10 miles long, that blows particulate pollution from factories or utility plants directly into the stratosphere; that pollution would also reflect sunlight. Roger Angel, a professor of optical sciences and astronomy at the University of Arizona, is studying an idea that's been around for more than 20 years: hanging a sunshade in space at the point where the gravitational pull is balanced between the Earth and the sun. Angel proposes using thin, transparent ceramic film that would hang as a cloud in space, deflecting enough solar radiation to keep global warming in check. Sound expensive? Try a few trillion dollars. "We'd have to get down launch costs," Angel admits. If only they gave Nobel Prizes for understatement.

Risks. In fact, every geoengineering design comes with significant pitfalls. Launching sulfate, a form of sulfur, into the stratosphere could cause ozone depletion and acid rain. Critics say Latham's plan would work on a regional level but might not provide the needed global benefits. Both would cost billions of dollars. More important, many scientists, including those who are cooking up geoengineering ideas, fear that such quick fixes would reduce the incentive to cut greenhouse gas emissions, which will continue to have adverse effects, such as ocean acidification. Alan Robock, a climatologist at Rutgers

University, also points out that once these projects ended, global temperatures would skyrocket. "To keep the world's environment hostage [to these projects] is scary."

Maybe so, but don't expect them to be dismissed out of hand. Davis is promising more hearings on climate change technology, which will probably include further discussion of geoengineering schemes. There are signs that the executive branch is also getting interested in these controversial ideas. NASA is holding a closed-door conference on geoengineering in November, and Crutzen says he has received an inquiry about his proposal from the Department of Energy. "You know in science somewhere there are answers," Davis says. "But the clock is running."

This story appears in the October 23, 2006 print edition of U.S. News & World Report.