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Not so 'far-out': Scientists warming up to ideas to battle temperature increases

By: SETH BORENSTEIN - Associated Press

WASHINGTON ---- Crazy-sounding ideas for saving the planet are getting a serious look from top scientists, a sign of their fears about global warming and the desire for an insurance policy in case things get worse.

How crazy?

There's the man-made "volcano" that shoots gigatons of sulfur high into the air. The space "sun shade" made of trillions of little reflectors between Earth and sun, slightly lowering the planet's temperature. The forest of ugly artificial "trees" that suck carbon dioxide out of the air. And the "Geritol solution" in which iron dust is dumped into the ocean.

"Of course it's desperation," Stanford University professor Stephen Schneider said. "It's planetary methadone for our planetary heroin addiction. It does come out of the pessimism of any realist that says this planet can't be trusted to do the right thing."

NASA is putting the finishing touches on a report summing up some of these ideas and has spent $75,000 to map out rough details of the sun shade concept. One of the premier climate modeling centers in the United States, the National Center for Atmospheric Research, has spent the last six weeks running computer simulations of the man-made volcano scenario and will soon turn its attention to the space umbrella idea.

And last month, billionaire Richard Branson offered a $25 million prize to the first feasible technology to reduce carbon dioxide levels in the air.

Simon "Pete" Worden, who heads NASA's Ames Research Center in Moffett Field, says that some of these proposals, which represent a field called geoengineering, have been characterized as anywhere from "great" to "idiotic." As if to distance NASA from the issue a bit, Worden said the agency's report won't do much more than explain the range of possibilities.

Scientists in the recent past have been reluctant to consider such concepts. Many fear that here will be unintended side effects; others worry that such schemes

might prevent the type of reduction in greenhouse gas emissions that scientists say are the only real way to fight global warming. These approaches are not an alternative to cutting pollution, said University of Calgary professor David Keith, a top geoengineering researcher.

Last month, Ralph Cicerone, president of the National Academy of Sciences, told the nation's largest science conference that more research must be done in this field, but no action should be taken yet.

Here is a look at some of the ideas:

The Geritol solution

A private company is already carrying out this plan. Some scientists call it promising, while others worry about the ecological fallout.

Planktos Inc. of Foster City recently launched its ship, the Weatherbird II, on a trip to the Pacific Ocean to dump 50 tons of iron dust. The iron should grow plankton, part of an algae bloom that will drink up carbon dioxide from the atmosphere.

The idea of seeding the ocean with iron to beef up a natural plankton and algae system has been tried on a small scale several times since 1990. It has both succeeded and failed.

Planktos Chief Executive officer Russ George said that his ship will try it on a larger scale, dumping a slurry of water and red iron dust from a hose into the sea.

"It makes a 25-foot swath of bright red for a very short period of time," George said.

The concept gained some credibility when it was mentioned in the 2001 report by the authoritative Intergovernmental Panel on Climate Change, which cited it as a possible way to attack carbon emissions.

Small experiments "showed unequivocally that there was a biological response to the addition of the iron," the climate report said. Plankton used the iron to photosynthesize, extract greenhouse gases from the air, and grow rapidly. It forms a thick green soup of all sorts of carbon dioxide-sucking algae, which sea life feast on, and the carbon drops into the ocean.

However, the international climate report also cautioned about "the ecological consequences of large-scale fertilization of the ocean."

Tim Barnett, a marine physicist at the Scripps Institution of Oceanography, said that large-scale ocean seeding could change the crucial temperature difference between the sea surface and deeper waters and have a dramatic effect on marine life.

Cicerone, a climate scientist who is president of the National Academy of Sciences and advocate for more geoengineering research, said that while the method has led to some promising science, he believes it is unlikely to be an effective way of removing significant amounts of carbon dioxide from the air.

George, Planktos' CEO, said that his company consulted with governments around the world and is only following previous scientific research. He said his firm will be dropping the iron in open international seas so he needs no permits. Most important, he said, is that it's such a small amount of iron compared to the ocean volume that it poses no threat.

He said it's unfair to lump his plan in with geoengineering, saying that his company is just trying to restore the ocean to "a more ecologically normal and balanced state."

"We're a green solution," George said.

Planktos officials say that for every ton of iron used, 100,000 tons of carbon will be pulled into the ocean. George said he hopes that ultimately 3 billion tons of carbon might be removed from Earth's atmosphere through a process that seeds the ocean with iron, half of what's needed. Some scientists say that's overstated.

Planktos' efforts are financed by companies and individuals who buy carbon credits to offset their use of fossil fuels.

Man-made volcano

When Mount Pinatubo erupted 16 years ago in the Philippines, it cooled the Earth for about a year because the sulfate particles in the upper atmosphere reflected some sunlight.

Several leading scientists, from Nobel Laureate Paul Crutzen to the late nuclear cold warrior Edward Teller, have proposed doing the same artificially to offset global warming.

Using jet engines, cannons or balloons to get sulfates in the air, humans could reduce the solar heat and only increase current sulfur pollution by a small percentage, said Tom Wigley of the National Center for Atmospheric Research.

"It's an issue of the lesser of two evils," he said.

Scientists at the Center for Atmospheric Research put the idea into a computer climate model. The results aren't particularly cheap or promising, NCAR scientist Caspar Ammann said. It would take tens of thousands of tons of sulfate to be injected into the air each month, he said.

"From a practical point of view, it's completely ridiculous," Amman said. "Instead of investing so much into this, it would be much easier to cut down on the initial problem."

Both this technique and the solar umbrella, while reducing heating, wouldn't reduce carbon dioxide. So they wouldn't counter a dramatic increase in the acidity of the world's oceans, which happens with global warming, scientists said. It harms sea life, especially coral reefs.

Despite that, Calgary's David Keith is working on tweaking the concept. He wants to find a more efficient chemical to inject into the atmosphere in case of emergency.

Solar umbrella

For far-out concepts, it's hard to beat Roger Angel's. Last fall, the University of Arizona astronomer proposed what he called a "sun shade." It would be a cloud of small Frisbee-like spaceships that go between the Earth and the sun and act as an umbrella, reducing heat from the sun.

"It really is just like turning down the knob by 2 percent of what's coming from the sun," he said.

The science for the ships, the rocketry to launch them, and the materials to make the shade are all doable, Angel said.

These nearly flat discs would each weigh less than an ounce and measure about a yard wide with three tablike "ears" that are controllers sticking out just a few inches.

About 800,000 of these would be stacked into each rocket launch. It would take 16 trillion of them ---- that's million million ---- so that there would be 20 million launches of rockets. All told, Angel figures 20 million tons of material to make the discs that together form the solar umbrella.

And then there's the cost: at least $4 trillion over 30 years, probably more.

"I compare it with sending men to Mars. I think they're both projects on the same scale," Angel said. "Given the danger to Earth, I think this project might warrant some fraction of the consideration of sending people to Mars."

Artificial trees

Scientifically, it's known as "air capture." But the instruments being used have been dubbed "artificial trees" ---- even though these devices are about as treelike as a radiator on a stick. They are designed to mimic the role of trees in using carbon dioxide, but early renderings show them looking more like the creation of a tinkering engineer with lots of steel.

Nearly a decade ago, Columbia University professor Klaus Lackner, hit on an idea for his then-middle school daughter's science fair project: Create air filters that grab carbon dioxide from the air using chemical absorbers and then compress the carbon dioxide into a liquid or compressed gas that can be shipped elsewhere. When his daughter was able to do it on a tiny scale, Lackner decided to look at doing it globally.

Newly inspired by the $25 million prize offered by Richard Branson, Lackner has fine-tuned the idea. He wants to develop a large filter that would absorb carbon dioxide from the air. Another chemical reaction would take the carbon from the absorbent material, and then a third process would change that greenhouse gas into a form that could be disposed of.

It would take wind and a lot of energy to power the air capture devices. They would stand tall like cell phone towers on steroids, reaching about 200 feet high with various-sized square filters at the top. Lackner envisions perhaps placing 100,000 of them near wind energy turbines.

Even if each filter was only the size of a TV, it could remove about 25 tons of carbon dioxide a year, which is about how much one American produces annually, Lackner said. The captured carbon dioxide would be changed into a liquid or gas that can be piped away from the air capture devices.

Disposal might be the biggest cost, Lackner said.

Disposal of carbon dioxide, including that from fossil fuel plant emissions, is a major issue of scientific and technological research called sequestration. The idea is to bury it underground, often in old oil wells or deep below the sea floor. The Bush administration, which doesn't like many geoengineering ideas, is spending hundreds of millions of dollars on carbon sequestration, but mostly for power plant emissions.

On the Net:

The Earth Engineering Center of Columbia University: http://www.seas.columbia.edu/earth/

The National Center for Atmospheric Research: http://www.ncar.ucar.edu/

Planktos Inc.: http://www.planktos.com/