The McGraw-Hill Companies
BusinessWeek

VIEWPOINT June 14, 2007, 12:01AM EST

White Is the New Green

Prepare yourselves for white parking lots and roofs, as the reflective shade joins green on the environment-friendly color palette

by Greg Blonder

Many techniques promise to mitigate global warmingð planting forests, nuclear power, bioethanol, and cars with better gas mileage, to name a few. The problem is so enormous and the potential adverse effects so disturbing that we may have to simultaneously implement all available solutions to make the slightest dent in rising carbon dioxide levels.

Unfortunately, we are often slaves to preconceived notions such as "complex problems require complex solutions." Take the surprising trade-offs between even the most technologically advanced solar panel and plain white paint. Which product would make you a better environmental citizen?

To arrive at an answer, consider the following:

Our sun illuminates the earth with a steady 1,350 watts per square meter. Some of this energy is absorbed by the atmosphere, some is reflected back into space, and some makes it to the earth's surface, where it might be absorbed or reflected as well. A black earth, like a black leather car interior, would be very hot indeed. Fortunately, white clouds, polar ice caps, and even deserts keep the earth's average reflectivity ("albedo" to planetary scientists) at around 30%ð giving our planet more of a beige leather interior, so to speak.

DEGREES AND WATTS

Countering this reflective system are greenhouse gases like CO_2 and methane. These now retain an additional 2 watts per square meter of solar energy over and above retention levels in preindustrial times. Such gases are disproportionately effective at capturing heat despite what actually remains a relatively small atmospheric concentration of 380 parts per million of CO_2. That minute increase in retained heat is fairly inconsequential if you are baking cookies in an oven. But for the earth as a whole, it's of critical importance, as the resulting extra few degrees is sufficient to melt the polar ice caps.

In this context, imagine a solar photovoltaic panel. Unlike burning coal or oil, the production of photovoltaic electricity does not add to the stock of global warming gases permeating our atmosphere. The panel's surface is pitch blackð all the better to absorb sunlight and convert it into electricity. On average, a panel that's 1 square meter in size will receive 300 watts of sunlight over a 24-hour period. In turning that sunlight into electricity, about 80% of that energy is lost due to the inefficient conversion process.

But if the remaining 20% is used to replace the equivalent amount of fossil fuel needed to produce that electricity, the result would be equivalent to eliminatingð every single dayð a square-meter column of CO_2 gas extending from earth to outer space. Put another way, each day that one panel would offset the equivalent of those extra 2 watts of global warming per square meter of earth we discussed earlier. Moreover, the effect would be cumulative: 4 fewer watts of global warming the second day, 6 fewer the third, and so on.

A PANEL DISCUSSION

But here's the rub. If, instead of a black solar panel absorbing light and producing electricity, you simply painted that square meter white, it would reflect back into outer space perhaps 50 of the 300 watts incident from the sun. So it would take about 25 days for the solar panel to catch up with the more efficient reflection of sunlight that the white-painted panel would provide in a single day.

This seems counterintuitive, of course, as solar panels are net-positive in reducing global warming. And, in many cases, you could install the black solar panel on an existing black building roof, so you wouldn't be "adding" yet another black, heat-absorbing surface (another "albedo-decreaser") to the earth.

Except for the small issue of money. A 20%-efficient, 1-square-meter solar panel costs about $1,000. For $1,000, you can buy 40 cans of good quality white paint. One can of paint covers 50 square meters with a nice bright reflecting film, and 40 cans would cover 2000 square meters. So for the same $1,000 investment you could buy one square meter of photovoltaic cells, or cover 2,000 square meters with white paint. It would take more than 2,000 times 25 days, or about a century, for the CO_2 mitigation from $1,000 of solar panels to catch up with the albedo increase of a large painted roof!

DOLLARS AND SENSE

So what's a conscientious environmentalist to do? Unquestionably, we need solar panels for electricity. You can't run a washing machine on white paint. But, for every dollar spent on solar panels, we should spend at least a dime on white paint for every roof, parking lot, and road in the country.

It offers a bigger, faster, and surer contribution to global warming reduction than more photovoltaic cells. And it would save on fuel costs. One estimate puts the annual national energy cost savings of more reflective roofs at $750 million, not including similar savings for lighter roads and parking lots. Perhaps such white roofs and parking lots deserve an energy subsidy from Congress. Perhaps white paint deserves to be traded on the carbon exchanges.

Perhaps white will become the new green.

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