Batteries not included.

Chapter 9: Less Dumb Global Warming Solutions

UNLESS YOU ARE committed to the idea that mankind should start living in caves and teepees, the solution to the global warming problem (to the extent a problem exists) ultimately lies in a single realm: technological advancement.

The economist Julian Simon has called mankind's creative and technological genius to solve problems our "ultimate resource." As mankind pushes back the frontiers of science and technology, we find better and cheaper ways to make the products that people need and want. And that creativity is the only hope that mankind has for substantially reducing carbon dioxide emissions.

So what do we need to do to make this happen? As it turns out, we already are doing much of what needs to be done. The United States government invests billions of your tax dollars in all kinds of energy research. Private industry likely invests even more than that.

These research and development efforts, however, are only made by countries that have generated sufficient wealth to afford

them. Those countries created their wealth by allowing their citizens the freedom to benefit economically from their new ideas and hard work. In contrast, most of the currently proposed policies for "doing something" about global warming destroy wealth and are ineffective. It is counterproductive to impose policies that offer only economic pain for little warming-reducing gain.

One might wonder, what happens if, as a result of widespread economic growth around the world, we suddenly experience shortages of energy. What if economic growth explodes in the developing nations, and global energy demand rises above our ability to produce it? While admittedly painful in the short term, this demand will actually help to bring those new technologies online even sooner.

As long as demand exceeds supply, high energy prices will hasten the development and use of new energy technologies. Competing energy sources that were too expensive before the shortage then become more cost competitive. This is the basic reason why mankind will never run out of petroleum, or any other natural resource, for that matter. At some point, it simply becomes too expensive to extract from the ground compared to less expensive alternatives.

The increased profits that energy companies enjoy during energy shortages enables the private sector to pursue those newer energy technologies more aggressively. Remember, these companies want to make money, and if there is profit potential in solar, wind, hydrogen, clean coal, or new technologies that we cannot even imagine at this point, they want a piece of that action.

Following are brief summaries of the major energy technologies, in no particular order, that appear to have some potential for substantially reducing carbon dioxide emissions. The treatment is not meant to be complete or exhaustive. And if history is any lesson, some new and unexpected technology will emerge in the coming decades that will greatly reduce our dependence on all other forms of energy.

NUCLEAR POWER

It is generally accepted that a combination of the 1979 release of the Jane Fonda film *The China Syndrome* and the coincidental Three Mile Island nuclear power plant accident only a few days later led to America's current aversion to nuclear power. This double-whammy on public perception has had a devastating effect on America's nuclear power industry.

But now it is time to objectively re-evaluate the role of nuclear energy in the American energy mix. It is unlikely that a dramatically new energy technology will come online in the next twenty to thirty years, but a dedicated effort to reinstitute nuclear power in the United States could make a sizeable dent in our use of fossil fuels. It cannot happen quickly, since it takes about ten years to license and construct a nuclear power plant. But new, safer, and less expensive reactor designs have been developed in recent years which will help reduce many of the previous risks and costs. It is somewhat ironic that many of the same progressive, environmentally conscious people who point to France as one of the countries we should model our country after would shudder at adopting France's method for generating electricity. Currently, about 75 percent of France's electricity comes from nuclear power plants; in the U.S., it's 19 percent

Unfortunately, public perceptions of safety problems and the resulting regulatory requirements on plant construction have put nuclear power on our energy black list. While any push to expand our use of nuclear energy would meet with opposition, even some environmental organizations are now admitting that the risk would be lower with nuclear power than the risk of global warming from fossil fuel use. Furthermore, if hydrogen fuel cell vehicles ever become widely used, a source of energy will be required to produce the hydrogen fuel, further shifting our energy production toward the electricity sector.

CLEAN COAL

Coal-fired power plants currently produce over one half of America's electricity. Coal reserves are abundant in the U.S., and if coal could be burned more cleanly, then the potential threat of global warming from this source of carbon dioxide would be reduced.

Sequestering (capturing and storing) carbon dioxide is one technology that is being researched. There are a couple of experimental power plants that are sequestering the CO_2 during coal burning. The CO_2 can be stored underground, for instance pumped into caves or petroleum deposits.

This is an evolving technology that is still relatively expensive, but such problems will likely be solved with time. It is estimated that the first, near-zero emissions coal-fired power plants will come online by about 2025.

HYDROGEN POWER

So, what is taking so long to achieve this "hydrogen economy" we keep hearing about? There is a hydrogen mine in the next county over from me, just waiting to be used for something. I think. Well, maybe not. Oh, now I remember, it takes *energy* to create hydrogen from water. Where will that energy come from? Maybe we could use the hydrogen-powered fuel cells to generate the electricity to make more hydrogen! We could call it a "perpetual motion machine."

One of the biggest obstacles to the widespread use of hydrogen as fuel is the fact that there is no naturally occurring, readily available source of hydrogen. Oh, sure, there is plenty of hydrogen all around us—but it just happens to be tied up right now, doing other things. While water contains abundant amounts of hydrogen, it is tightly bound to oxygen (H_2O), and so it takes energy to separate it from water.

If hydrogen power ends up being widely used as a way to

avoid emitting carbon dioxide, it will likely require much greater amounts of electricity, which probably means nuclear and clean coal (see above). It has been estimated that for hydrogen to fuel our transportation needs, the electrical generating capacity in the United States will need to approximately double.

Also, there are still some technological and practical challenges with hydrogen-powered cars. For instance, hydrogen is very flammable and presents greater dangers in the event of an accident than does gasoline. Gasoline will burn only over a very narrow range of air-to-fuel mixtures. Hydrogen is flammable over a much broader range. Thus, there will be greater dangers during refueling of a hydrogen-powered vehicle compared to a gasoline-fueled vehicle.

Also, the energy content of hydrogen is relatively low. In order to store an amount of hydrogen in an automobile that will provide the traveling distance available with gasoline, it must be compressed to very high pressures, further increasing risks during refueling and collisions.

Presumably, the technological challenges and risks will eventually be reduced to the point where hydrogen-powered transportation makes sense. In general, though, this technology is not as ready as many people think it is.

SOLAR AND WIND ENERGY

The allure of getting energy directly from these clean sources has always been strong. After all, the sun is what has energized all of our other sources of energy. While the use of solar power is steadily growing, it still remains a very small part of our energy mix, less than 1 percent, and it will remain so for a very long time to come.

Despite its small role, however, I have listed it in the Less Dumb Solutions chapter because it does make sense in certain applications, and because there is still the possibility that new advances (example described below) will make it more cost competitive, and thus more widely used.

The biggest problem with solar electric power remains its low energy density. The amount of sunlight that needs to be gathered to produce a substantial amount of electricity requires large areas of solar collectors. Nevertheless, there are inherent advantages of solar power. There are few, or no, moving parts for photovoltaic (PV) collectors. They can be built, and thus distributed on any scale—even for individual homes. PV technology is still relatively inefficient (about 15 percent) at converting the sunlight into electricity, but research continues into improving that efficiency.

In contrast, thermal solar systems, which can provide much of a home's domestic hot water needs in relatively sunny climates, have much higher efficiencies—closer to 90 percent. And, like solar systems, they can be implemented on a home-by-home basis. From an economic standpoint, this provides the consumer with control over the decision whether to use this source of energy or not.

Two relatively new solar technologies look intriguing to me. First, solar towers (also called solar chimneys) can capture the daily production of warm air under several square kilometers of glass-covered desert land. Since warm air that is surrounded by cooler air wants to rise, this produces a wind under the glass canopy that flows toward a central towering chimney. Turbines at the base of the tower convert the self-contained wind field energy into electricity as the warm, buoyant air rises in the tower.

The total amount of energy that can be produced in a solar tower increases with the tower height. Current tower designs run about 1 kilometer high. If such a tower could be built, it would be the tallest manmade structure on Earth. As such, it would also make a very cool tourist attraction. As of this writing, Australia is the only country that is actively involved in the planned design and construction of such a facility. A 50-kilowatt concept demonstration facility was successfully operated in Spain for several years.

Second, in the photovoltaic realm, Pyron Solar has developed an inexpensive technology to focus the sun's rays on photovoltaic cells at a very high intensity, equivalent to 400 suns. At

this intensity, the cells are much more efficient at converting sunlight into electricity—about 35 percent efficiency rather than the normal 15 percent. As a result of these features, most of the expensive PV cells in such a collector can be eliminated, and the few that are used produce over twice as much electricity as those in normal applications.

Like solar power, wind power is being increasingly exploited, but still on relatively small scales. The current technology is now cost competitive in some parts of the country, but like solar, large amounts of land must be covered by windmills to generate substantial energy. Most people do not want windmills near where they live since they are considered to be somewhat of an eyesore.

While government subsidies and tax breaks can help jumpstart these technologies, private industry is typically reluctant to invest much in technologies that are not fairly close to being cost effective already. In cases of artificial government support, when the subsidies and tax breaks end, the technologies once again languish. We have been down this road before during the "energy crisis" of the 1970s, and the laws of economics have not changed since then. Until fossil fuels become scarcer, and thus more expensive, either the price of these alternative technologies must be brought down, or their efficiency at generating electricity must be increased.

As the manufacturing costs of solar and wind power technologies continue to fall, and if the cost of other traditional sources of energy rise, solar and wind energy use will continue to grow. But the inherent limitation of the amount of wind energy or solar energy available over the solar collector area, or the wind turbine's blade area, means that they will continue to be minor contributors to the total energy needs of humanity. Nevertheless, I have included them in the Less Dumb Solutions chapter because, if the public had sufficient will, these technologies could be deployed relatively soon on as large a scale as we would be willing to pay for—financially and aesthetically.

BIOFUELS

There is increasing interest in using plant matter to replace some of the gasoline and diesel fuel that we currently extract from petroleum. Because of the sheer volume of fuel we use, however, it has been estimated that all of the corn grown in the U.S. would replace only about 12 percent of our gasoline needs.

As more ethanol for gasoline (and vegetable oil for diesel fuel) is produced, there is the unintended consequence of rising food prices. If the supply of crops does not increase in proportion to demand, prices must rise. As a result, some foods become more expensive and, once again, the poor are the first to suffer.

In summary, there are a few existing alternatives to fossil fuels than can somewhat reduce our greenhouse gas emissions. But to really make a major contribution to the problem we will need major technological advances. The good news is that both the government and private industry are investing in new energy research. It will take time for these new technologies to come online, however. Nuclear and clean coal both have promise, but substantial expansion of their use will take ten years or more in the case of nuclear, twenty years in the case of clean coal.

There are no quick fixes. The smart solutions to the global warming problem will take time. It is therefore important that we do not become impatient, because it is impatience that leads to governmental policies that have a history of doing more harm that good. Again I will emphasize, when politicians start pushing for legislation to attack global warming, we must ask them two questions: "How much will it cost?" and, even more importantly, "How much will it help?"

Unless we are smart about our policies, at best we will merely have "feel good" measures that do little more than make a few politicians look noble. At worst, the time and wealth that is wasted on expensive and ineffective policies will delay the development of the technological advances that represent our only hope for greatly reducing carbon dioxide emissions.

THE FUTURE

The solutions to current environmental problems in general, and the global warming problem in particular, largely depend upon an informed public. Economically, you vote for specific goods and services with your dollars, and so you have some control over what kinds of pollution you are producing as a result. Politically, you vote for representatives who are, for the most part, going to follow the desires of their constituents in formulating public policy.

Wielding this economic and political power responsibly requires knowledge. And that, I'm afraid, is where we have a major problem to overcome.

The environmentalist agenda tends to be anti-progress, ignoring the only real solution to the global warming problem: human ingenuity and technological advancement. Environmentalists tend to appeal to our emotions when they push for certain policies, and this is dangerous because it can lead to bad decisions. Energy is a physically produced, economically driven commodity, and there is no way to avoid the realities of physics and economics when developing smart energy policies. It is time to "Imagine Reality." It is time to shout down the environmental extremists who perpetuate exaggerated views of risk and never mention benefits when discussing energy use. No one lives their lives avoiding all risk and ignoring benefits, including the environmentalists.

It is unfortunate that media reporting in the U.S. tends to be biased toward social and political agendas that perpetuate environmental, social, and economic myths and half-truths. As a result of the media's narrow views, the public continues to be misled on important environmental matters. Too many people remain unaware of the real costs and human consequences of some the currently proposed environmental policies. While a few have spoken out on the widespread public misconceptions about environmental risks (e.g., Bjorn Lomborg and John Stossel), for the most part the problem still exists.

I'm sure that journalists have good intentions, but they are apparently unaware that their ideologically biased reporting on such important policy matters can do more harm than good. It is easy to whip up public hysteria. It is not so easy to look beyond one's own biases to understand global warming science and policy issues. Fortunately, alternative media sources such as the internet and cable news are enabling more diverse views on environmental issues to be advanced and discussed. Facts and reasoned debate are necessary if we are to avoid letting our emotional attachment to some supposed solution get in the way of finding real solutions.

When it comes to environmental issues in general, and global warming in particular, the future of humanity lies in Julian Simon's "ultimate resource": human creativity. This creativity needs to be fostered and rewarded, not stifled. While working to improve the human condition, people need to be viewed more as producers and stewards, rather than consumers and polluters.

Everyone seems to appreciate the desirability of the United States becoming more energy independent. Our dependence on energy sources from politically unstable countries is very risky, and represents a strategic vulnerability. But as long as the supposed "rights" of nature supersede the rights of the people to use the natural resources that they require to thrive, the United States will never approach energy independence. You can't simply wish or legislate new energy sources into existence.

The world has immense coal reserves, possibly enough for another 1,000 years or more. If the by-products of coal combustion (e.g., mercury, carbon dioxide) that are not yet scrubbed out can be greatly reduced or captured, then mankind will have a relatively clean source of energy for a long time to come. And these clean electrical generation technologies will be needed if we ever achieve the hydrogen economy. Hydrogen will need to be extracted from water, and energy will be required for this conversion.

I predict that when these technologies are ready, environmental fears in the headlines will continue. Environmental worriers

have worldviews and jobs at stake. Anything that is good for human progress is going to be portrayed as bad for the environment, period. In the real world, risk can never be eliminated, and so the worriers will never be satisfied.

The technological advances that we need will be considerably delayed if we do not encourage the continued generation of wealth. It is the wealthy countries of the world that can afford the large investments in research and technology that will bring about these advancements. Punitive policies such as mandated reductions in carbon dioxide emissions will have little impact on future global temperatures, and it could easily result in a global economic recession. This, in turn, could delay by many years the necessary technological advances we need. This is especially true in the private sector where, in the face of an economic downturn, the first place that companies cut investment is research and development.

The good news that you never hear about is that the United States government is already investing billions of your tax dollars in new energy technologies. Private industry is no doubt investing heavily as well. All of humanity requires access to affordable energy, and the need will never go away. As long as billions of the Earth's inhabitants continue to try to elevate themselves above poverty, there will be a continuing growth in energy use. And as long as there is a desire for cleaner energy, new technologies will provide our only way of getting there.

Chapter 10: Summary

WE ARE RAPIDLY entering an age where too much free time, too much faith in the ability of science to predict the future, and too little spiritual fulfillment are leading too many people to believe in pseudo-scientific predictions of environmental disasters. As the mother of all these threats, global warming is now perceived to be the ultimate global crisis against which all mankind must unite. There is a religious fervor that accompanies this belief, and as a result we are now scaring ourselves (and our children) to death with the new state-supported religion and its teachings of mankind's sins against Mother Earth.

I have nothing against people's religious beliefs—only their labeling them as "science."

Environmentalists, politicians, movie stars, and the media all want you to believe that currently proposed solutions to global warming will save the Earth, help the poor, and keep humanity from destroying itself. This book has explained why I believe that the Earth's climate system is not nearly as sensitive to humanity's greenhouse gas emissions as many scientists think it is.

But even if those scientists are correct, and dangerous levels of