



April 15, 2007

The Power of Green

By Thomas L. Friedman

I.

One day Iraq, our post-9/11 trauma and the divisiveness of the Bush years will all be behind us — and America will need, and want, to get its groove back. We will need to find a way to reknit America at home, reconnect America abroad and restore America to its natural place in the global order — as the beacon of progress, hope and inspiration. I have an idea how. It's called "green."

In the world of ideas, to name something is to own it. If you can name an issue, you can own the issue. One thing that always struck me about the term "green" was the degree to which, for so many years, it was defined by its opponents — by the people who wanted to disparage it. And they defined it as "liberal," "tree-hugging," "sissy," "girlie-man," "unpatriotic," "vaguely French."

Well, I want to rename "green." I want to rename it geostrategic, geoeconomic, capitalistic and patriotic. I want to do that because I think that living, working, designing, manufacturing and projecting America in a green way can be the basis of a new unifying political movement for the 21st century. A redefined, broader and more muscular green ideology is not meant to trump the traditional Republican and Democratic agendas but rather to bridge them when it comes to addressing the three major issues facing every American today: jobs, temperature and terrorism.

How do our kids compete in a flatter world? How do they thrive in a warmer world? How do they survive in a more dangerous world? Those are, in a nutshell, the big questions facing America at the dawn of the 21st century. But these problems are so large in scale that they can only be effectively addressed by an America with 50 green states — not an America divided between red and blue states.

Because a new green ideology, properly defined, has the power to mobilize liberals and conservatives, evangelicals and atheists, big business and environmentalists around an agenda that can both pull us together and propel us forward. That's why I say: We don't just need the first black president. We need the first green president. We don't just need the first woman president. We need the first environmental president. We don't just need a president who has been toughened by years as a prisoner of war but a president who is tough enough to level with the American people about the

profound economic, geopolitical and climate threats posed by our addiction to oil — and to offer a real plan to reduce our dependence on fossil fuels.

After World War II, President Eisenhower responded to the threat of Communism and the “red menace” with massive spending on an interstate highway system to tie America together, in large part so that we could better move weapons in the event of a war with the Soviets. That highway system, though, helped to enshrine America’s car culture (atrophying our railroads) and to lock in suburban sprawl and low-density housing, which all combined to get America addicted to cheap fossil fuels, particularly oil. Many in the world followed our model.

Today, we are paying the accumulated economic, geopolitical and climate prices for that kind of America. I am not proposing that we radically alter our lifestyles. We are who we are — including a car culture. But if we want to continue to be who we are, enjoy the benefits and be able to pass them on to our children, we do need to fuel our future in a cleaner, greener way. Eisenhower rallied us with the red menace. The next president will have to rally us with a green patriotism. Hence my motto: “Green is the new red, white and blue.”

The good news is that after traveling around America this past year, looking at how we use energy and the emerging alternatives, I can report that green really has gone Main Street — thanks to the perfect storm created by 9/11, Hurricane Katrina and the Internet revolution. The first flattened the twin towers, the second flattened New Orleans and the third flattened the global economic playing field. The convergence of all three has turned many of our previous assumptions about “green” upside down in a very short period of time, making it much more compelling to many more Americans.

But here’s the bad news: While green has hit Main Street — more Americans than ever now identify themselves as greens, or what I call “Geo-Greens” to differentiate their more muscular and strategic green ideology — green has not gone very far down Main Street. It certainly has not gone anywhere near the distance required to preserve our lifestyle. The dirty little secret is that we’re fooling ourselves. We in America talk like we’re already “the greenest generation,” as the business writer Dan Pink once called it. But here’s the really inconvenient truth: We have not even begun to be serious about the costs, the effort and the scale of change that will be required to shift our country, and eventually the world, to a largely emissions-free energy infrastructure over the next 50 years.

II.

A few weeks after American forces invaded Afghanistan, I visited the Pakistani frontier town of Peshawar, a hotbed of Islamic radicalism. On the way, I stopped at the famous Darul Uloom Haqqania, the biggest madrasa, or Islamic school, in Pakistan, with 2,800 live-in students. The Taliban leader Mullah Muhammad Omar attended this madrasa as a younger man. My Pakistani friend and I were allowed to observe a class of young boys who sat on the floor, practicing their rote learning of the Koran from texts perched on wooden holders. The air in the Koran class was so thick and stale it felt as if you could have cut it into blocks. The teacher asked an 8-year-old boy to chant a Koranic verse for us, which he did with the elegance of an experienced muezzin. I asked another student, an Afghan refugee, Rahim Kunduz, age 12, what his reaction was to the Sept. 11 attacks, and he said: “Most likely the attack came from Americans inside America. I am pleased that America

has had to face pain, because the rest of the world has tasted its pain.” A framed sign on the wall said this room was “A gift of the Kingdom of Saudi Arabia.”

Sometime after 9/11 — an unprovoked mass murder perpetrated by 19 men, 15 of whom were Saudis — green went geostrategic, as Americans started to realize we were financing both sides in the war on terrorism. We were financing the U.S. military with our tax dollars; and we were financing a transformation of Islam, in favor of its most intolerant strand, with our gasoline purchases. How stupid is that?

Islam has always been practiced in different forms. Some are more embracing of modernity, reinterpretation of the Koran and tolerance of other faiths, like Sufi Islam or the populist Islam of Egypt, Ottoman Turkey and Indonesia. Some strands, like Salafi Islam — followed by the Wahhabis of Saudi Arabia and by Al Qaeda — believe Islam should be returned to an austere form practiced in the time of the Prophet Muhammad, a form hostile to modernity, science, “infidels” and women’s rights. By enriching the Saudi and Iranian treasuries via our gasoline purchases, we are financing the export of the Saudi puritanical brand of Sunni Islam and the Iranian fundamentalist brand of Shiite Islam, tilting the Muslim world in a more intolerant direction. At the Muslim fringe, this creates more recruits for the Taliban, Al Qaeda, Hamas, Hezbollah and the Sunni suicide bomb squads of Iraq; at the Muslim center, it creates a much bigger constituency of people who applaud suicide bombers as martyrs.

The Saudi Islamic export drive first went into high gear after extreme fundamentalists challenged the Muslim credentials of the Saudi ruling family by taking over the Grand Mosque of Mecca in 1979 — a year that coincided with the Iranian revolution and a huge rise in oil prices. The attack on the Grand Mosque by these Koran-and-rifle-wielding Islamic militants shook the Saudi ruling family to its core. The al-Sauds responded to this challenge to their religious bona fides by becoming outwardly more religious. They gave their official Wahhabi religious establishment even more power to impose Islam on public life. Awash in cash thanks to the spike in oil prices, the Saudi government and charities also spent hundreds of millions of dollars endowing mosques, youth clubs and Muslim schools all over the world, ensuring that Wahhabi imams, teachers and textbooks would preach Saudi-style Islam. Eventually, notes Lawrence Wright in “The Looming Tower,” his history of Al Qaeda, “Saudi Arabia, which constitutes only 1 percent of the world Muslim population, would support 90 percent of the expenses of the entire faith, overriding other traditions of Islam.”

Saudi mosques and wealthy donors have also funneled cash to the Sunni insurgents in Iraq. The Associated Press reported from Cairo in December: “Several drivers interviewed by the A.P. in Middle East capitals said Saudis have been using religious events, like the hajj pilgrimage to Mecca and a smaller pilgrimage, as cover for illicit money transfers. Some money, they said, is carried into Iraq on buses with returning pilgrims. ‘They sent boxes full of dollars and asked me to deliver them to certain addresses in Iraq,’ said one driver. ... ‘I know it is being sent to the resistance, and if I don’t take it with me, they will kill me.’ ”

No wonder more Americans have concluded that conserving oil to put less money in the hands of hostile forces is now a geostrategic imperative. President Bush’s refusal to do anything meaningful after 9/11 to reduce our gasoline usage really amounts to a policy of “No Mullah Left Behind.” James

Woolsey, the former C.I.A. director, minces no words: “We are funding the rope for the hanging of ourselves.”

No, I don’t want to bankrupt Saudi Arabia or trigger an Islamist revolt there. Its leadership is more moderate and pro-Western than its people. But the way the Saudi ruling family has bought off its religious establishment, in order to stay in power, is not healthy. Cutting the price of oil in half would help change that. In the 1990s, dwindling oil income sparked a Saudi debate about less Koran and more science in Saudi schools, even experimentation with local elections. But the recent oil windfall has stilled all talk of reform.

That is because of what I call the First Law of Petropolitics: The price of oil and the pace of freedom always move in opposite directions in states that are highly dependent on oil exports for their income and have weak institutions or outright authoritarian governments. And this is another reason that green has become geostrategic. Soaring oil prices are poisoning the international system by strengthening antidemocratic regimes around the globe.

Look what’s happened: We thought the fall of the Berlin Wall was going to unleash an unstoppable tide of free markets and free people, and for about a decade it did just that. But those years coincided with oil in the \$10-to-\$30-a-barrel range. As the price of oil surged into the \$30-to-\$70 range in the early 2000s, it triggered a countertide — a tide of petroauthoritarianism — manifested in Russia, Iran, Nigeria, Venezuela, Saudi Arabia, Syria, Sudan, Egypt, Chad, Angola, Azerbaijan and Turkmenistan. The elected or self-appointed elites running these states have used their oil windfalls to ensconce themselves in power, buy off opponents and counter the fall-of-the-Berlin-Wall tide. If we continue to finance them with our oil purchases, they will reshape the world in their image, around Putin-like values.

You can illustrate the First Law of Petropolitics with a simple graph. On one line chart the price of oil from 1979 to the present; on another line chart the Freedom House or Fraser Institute freedom indexes for Russia, Nigeria, Iran and Venezuela for the same years. When you put these two lines on the same graph you see something striking: the price of oil and the pace of freedom are inversely correlated. As oil prices went down in the early 1990s, competition, transparency, political participation and accountability of those in office all tended to go up in these countries — as measured by free elections held, newspapers opened, reformers elected, economic reform projects started and companies privatized. That’s because their petroauthoritarian regimes had to open themselves to foreign investment and educate and empower their people more in order to earn income. But as oil prices went up around 2000, free speech, free press, fair elections and freedom to form political parties and NGOs all eroded in these countries.

The motto of the American Revolution was “no taxation without representation.” The motto of the petroauthoritarians is “no representation without taxation”: If I don’t have to tax you, because I can get all the money I need from oil wells, I don’t have to listen to you.

It is no accident that when oil prices were low in the 1990s, Iran elected a reformist Parliament and a president who called for a “dialogue of civilizations.” And when oil prices soared to \$70 a barrel, Iran’s conservatives pushed out the reformers and ensconced a president who says the Holocaust is a myth. (I promise you, if oil prices drop to \$25 a barrel, the Holocaust won’t be a myth anymore.)

And it is no accident that the first Arab Gulf state to start running out of oil, Bahrain, is also the first Arab Gulf state to have held a free and fair election in which women could run and vote, the first Arab Gulf state to overhaul its labor laws to make more of its own people employable and the first Arab Gulf state to sign a free-trade agreement with America.

People change when they have to — not when we tell them to — and falling oil prices make them have to. That is why if we are looking for a Plan B for Iraq — a way of pressing for political reform in the Middle East without going to war again — there is no better tool than bringing down the price of oil. When it comes to fostering democracy among petroauthoritarians, it doesn't matter whether you're a neocon or a radical lib. If you're not also a Geo-Green, you won't succeed.

The notion that conserving energy is a geostrategic imperative has also moved into the Pentagon, for slightly different reasons. Generals are realizing that the more energy they save in the heat of battle, the more power they can project. The Pentagon has been looking to improve its energy efficiency for several years now to save money. But the Iraq war has given birth to a new movement in the U.S. military: the "Green Hawks."

As Amory Lovins of the Rocky Mountain Institute, who has been working with the Pentagon, put it to me: The Iraq war forced the U.S. military to think much more seriously about how to "eat its tail" — to shorten its energy supply lines by becoming more energy efficient. According to Dan Nolan, who oversees energy projects for the U.S. Army's Rapid Equipping Force, it started last year when a Marine major general in Anbar Province told the Pentagon he wanted alternative energy sources that would reduce fuel consumption in the Iraqi desert. Why? His air-conditioners were being run off mobile generators, and the generators ran on diesel, and the diesel had to be trucked in, and the insurgents were blowing up the trucks.

"When we began the analysis of his request, it was really about the fact that his soldiers were being attacked on the roads bringing fuel and water," Nolan said. So eating their tail meant "taking those things that are brought into the unit and trying to generate them on-site." To that end Nolan's team is now experimenting with everything from new kinds of tents that need 40 percent less air-conditioning to new kinds of fuel cells that produce water as a byproduct.

Pay attention: When the U.S. Army desegregated, the country really desegregated; when the Army goes green, the country could really go green.

"Energy independence is a national security issue," Nolan said. "It's the right business for us to be in. ... We are not trying to change the whole Army. Our job is to focus on that battalion out there and give those commanders the technological innovations they need to deal with today's mission. But when they start coming home, they are going to bring those things with them."

III.

The second big reason green has gone Main Street is because global warming has. A decade ago, it was mostly experts who worried that climate change was real, largely brought about by humans and likely to lead to species loss and environmental crises. Now Main Street is starting to worry because people are seeing things they've never seen before in their own front yards and reading things they've

never read before in their papers — like the recent draft report by the United Nations’s 2,000-expert Intergovernmental Panel on Climate Change, which concluded that “changes in climate are now affecting physical and biological systems on every continent.”

I went to Montana in January and Gov. Brian Schweitzer told me: “We don’t get as much snow in the high country as we used to, and the runoff starts sooner in the spring. The river I’ve been fishing over the last 50 years is now warmer in July by five degrees than 50 years ago, and it is hard on our trout population.” I went to Moscow in February, and my friends told me they just celebrated the first Moscow Christmas in their memory with no snow. I stopped in London on the way home, and I didn’t need an overcoat. In 2006, the average temperature in central England was the highest ever recorded since the Central England Temperature (C.E.T.) series began in 1659.

Yes, no one knows exactly what will happen. But ever fewer people want to do nothing. Gov. Arnold Schwarzenegger of California summed up the new climate around climate when he said to me recently: “If 98 doctors say my son is ill and needs medication and two say ‘No, he doesn’t, he is fine,’ I will go with the 98. It’s common sense — the same with global warming. We go with the majority, the large majority. ... The key thing now is that since we know this industrial age has created it, let’s get our act together and do everything we can to roll it back.”

But how? Now we arrive at the first big roadblock to green going down Main Street. Most people have no clue — no clue — how huge an industrial project is required to blunt climate change. Here are two people who do: Robert Socolow, an engineering professor, and Stephen Pacala, an ecology professor, who together lead the Carbon Mitigation Initiative at Princeton, a consortium designing scalable solutions for the climate issue.

They first argued in a paper published by the journal *Science* in August 2004 that human beings can emit only so much carbon into the atmosphere before the buildup of carbon dioxide (CO₂) reaches a level unknown in recent geologic history and the earth’s climate system starts to go “haywire.” The scientific consensus, they note, is that the risk of things going haywire — weather patterns getting violently unstable, glaciers melting, prolonged droughts — grows rapidly as CO₂ levels “approach a doubling” of the concentration of CO₂ that was in the atmosphere before the Industrial Revolution.

“Think of the climate change issue as a closet, and behind the door are lurking all kinds of monsters — and there’s a long list of them,” Pacala said. “All of our scientific work says the most damaging monsters start to come out from behind that door when you hit the doubling of CO₂ levels.” As Bill Collins, who led the development of a model used worldwide for simulating climate change, put it to me: “We’re running an uncontrolled experiment on the only home we have.”

So here is our challenge, according to Pacala: If we basically do nothing, and global CO₂ emissions continue to grow at the pace of the last 30 years for the next 50 years, we will pass the doubling level — an atmospheric concentration of carbon dioxide of 560 parts per million — around midcentury. To avoid that — and still leave room for developed countries to grow, using less carbon, and for countries like India and China to grow, emitting double or triple their current carbon levels, until they climb out of poverty and are able to become more energy efficient — will require a huge global industrial energy project.

To convey the scale involved, Socolow and Pacala have created a pie chart with 15 different wedges. Some wedges represent carbon-free or carbon-diminishing power-generating technologies; other wedges represent efficiency programs that could conserve large amounts of energy and prevent CO₂ emissions. They argue that the world needs to deploy any 7 of these 15 wedges, or sufficient amounts of all 15, to have enough conservation, and enough carbon-free energy, to increase the world economy and still avoid the doubling of CO₂ in the atmosphere. Each wedge, when phased in over 50 years, would avoid the release of 25 billion tons of carbon, for a total of 175 billion tons of carbon avoided between now and 2056.

Here are seven wedges we could chose from: “Replace 1,400 large coal-fired plants with gas-fired plants; increase the fuel economy of two billion cars from 30 to 60 miles per gallon; add twice today’s nuclear output to displace coal; drive two billion cars on ethanol, using one-sixth of the world’s cropland; increase solar power 700-fold to displace coal; cut electricity use in homes, offices and stores by 25 percent; install carbon capture and sequestration capacity at 800 large coal-fired plants.” And the other eight aren’t any easier. They include halting all cutting and burning of forests, since deforestation causes about 20 percent of the world’s annual CO₂ emissions.

“There has never been a deliberate industrial project in history as big as this,” Pacala said. Through a combination of clean power technology and conservation, “we have to get rid of 175 billion tons of carbon over the next 50 years — and still keep growing. It is possible to accomplish this if we start today. But every year that we delay, the job becomes more difficult — and if we delay a decade or two, avoiding the doubling or more may well become impossible.”

IV.

In November, I flew from Shanghai to Beijing on Air China. As we landed in Beijing and taxied to the terminal, the Chinese air hostess came on the P.A. and said: “We’ve just landed in Beijing. The temperature is 8 degrees Celsius, 46 degrees Fahrenheit and the sky is clear.”

I almost burst out laughing. Outside my window the smog was so thick you could not see the end of the terminal building. When I got into Beijing, though, friends told me the air was better than usual. Why? China had been host of a summit meeting of 48 African leaders. Time magazine reported that Beijing officials had “ordered half a million official cars off the roads and said another 400,000 drivers had ‘volunteered’ to refrain from using their vehicles” in order to clean up the air for their African guests. As soon as they left, the cars returned, and Beijing’s air went back to “unhealthy.”

Green has also gone Main Street because the end of Communism, the rise of the personal computer and the diffusion of the Internet have opened the global economic playing field to so many more people, all coming with their own versions of the American dream — a house, a car, a toaster, a microwave and a refrigerator. It is a blessing to see so many people growing out of poverty. But when three billion people move from “low-impact” to “high-impact” lifestyles, Jared Diamond wrote in “Collapse,” it makes it urgent that we find cleaner ways to fuel their dreams. According to Lester Brown, the founder of the Earth Policy Institute, if China keeps growing at 8 percent a year, by 2031 the per-capita income of 1.45 billion Chinese will be the same as America’s in 2004. China currently has only one car for every 100 people, but Brown projects that as it reaches American income levels,

if it copies American consumption, it will have three cars for every four people, or 1.1 billion vehicles. The total world fleet today is 800 million vehicles!

That's why McKinsey Global Institute forecasts that developing countries will generate nearly 80 percent of the growth in world energy demand between now and 2020, with China representing 32 percent and the Middle East 10 percent. So if Red China doesn't become Green China there is no chance we will keep the climate monsters behind the door. On some days, says the U.S. Environmental Protection Agency, almost 25 percent of the polluting matter in the air above Los Angeles comes from China's coal-fired power plants and factories, as well as fumes from China's cars and dust kicked up by droughts and deforestation around Asia.

The good news is that China knows it has to grow green — or it won't grow at all. On Sept. 8, 2006, a Chinese newspaper reported that China's E.P.A. and its National Bureau of Statistics had re-examined China's 2004 G.D.P. number. They concluded that the health problems, environmental degradation and lost workdays from pollution had actually cost China \$64 billion, or 3.05 percent of its total economic output for 2004. Some experts believe the real number is closer to 10 percent.

Thus China has a strong motivation to clean up the worst pollutants in its air. Those are the nitrogen oxides, sulfur oxides and mercury that produce acid rain, smog and haze — much of which come from burning coal. But cleaning up is easier said than done. The Communist Party's legitimacy and the stability of the whole country depend heavily on Beijing's ability to provide rising living standards for more and more Chinese.

So, if you're a Chinese mayor and have to choose between growing jobs and cutting pollution, you will invariably choose jobs: coughing workers are much less politically dangerous than unemployed workers. That's a key reason why China's 10th five-year plan, which began in 2000, called for a 10 percent reduction in sulfur dioxide in China's air — and when that plan concluded in 2005, sulfur dioxide pollution in China had increased by 27 percent.

But if China is having a hard time cleaning up its nitrogen and sulfur oxides — which can be done relatively cheaply by adding scrubbers to the smokestacks of coal-fired power plants — imagine what will happen when it comes to asking China to curb its CO₂, of which China is now the world's second-largest emitter, after America. To build a coal-fired power plant that captures, separates and safely sequesters the CO₂ into the ground before it goes up the smokestack requires either an expensive retrofit or a whole new system. That new system would cost about 40 percent more to build and operate — and would produce 20 percent less electricity, according to a recent M.I.T. study, "The Future of Coal."

China — which is constructing the equivalent of two 500-megawatt coal-fired power plants every week — is not going to pay that now. Remember: CO₂ is an invisible, odorless, tasteless gas. Yes, it causes global warming — but it doesn't hurt anyone in China today, and getting rid of it is costly and has no economic payoff. China's strategy right now is to say that CO₂ is the West's problem. "It must be pointed out that climate change has been caused by the long-term historic emissions of developed countries and their high per-capita emissions," Jiang Yu, a spokeswoman for China's Foreign Ministry, declared in February. "Developed countries bear an unshirkable responsibility."

So now we come to the nub of the issue: Green will not go down Main Street America unless it also goes down Main Street China, India and Brazil. And for green to go Main Street in these big developing countries, the prices of clean power alternatives — wind, biofuels, nuclear, solar or coal sequestration — have to fall to the “China price.” The China price is basically the price China pays for coal-fired electricity today because China is not prepared to pay a premium now, and sacrifice growth and stability, just to get rid of the CO₂ that comes from burning coal.

“The ‘China price’ is the fundamental benchmark that everyone is looking to satisfy,” said Curtis Carlson, C.E.O. of SRI International, which is developing alternative energy technologies. “Because if the Chinese have to pay 10 percent more for energy, when they have tens of millions of people living under \$1,000 a year, it is not going to happen.” Carlson went on to say: “We have an enormous amount of new innovation we must put in place before we can get to a price that China and India will be able to pay. But this is also an opportunity.”

V.

The only way we are going to get innovations that drive energy costs down to the China price — innovations in energy-saving appliances, lights and building materials and in non-CO₂-emitting power plants and fuels — is by mobilizing free-market capitalism. The only thing as powerful as Mother Nature is Father Greed. To a degree, the market is already at work on this project — because some venture capitalists and companies understand that clean-tech is going to be the next great global industry. Take Wal-Mart. The world’s biggest retailer woke up several years ago, its C.E.O. Lee Scott told me, and realized that with regard to the environment its customers “had higher expectations for us than we had for ourselves.” So Scott hired a sustainability expert, Jib Ellison, to tutor the company. The first lesson Ellison preached was that going green was a whole new way for Wal-Mart to cut costs and drive its profits. As Scott recalled it, Ellison said to him, “Lee, the thing you have to think of is all this stuff that people don’t want you to put into the environment is waste — and you’re paying for it!”

So Scott initiated a program to work with Wal-Mart’s suppliers to reduce the sizes and materials used for all its packaging by five percent by 2013. The reductions they have made are already paying off in savings to the company. “We created teams to work across the organization,” Scott said. “It was voluntary — then you had the first person who eliminated some packaging, and someone else started showing how we could recycle more plastic, and all of a sudden it’s \$1 million a quarter.” Wal-Mart operates 7,000 huge Class 8 trucks that get about 6 miles per gallon. It has told its truck makers that by 2015, it wants to double the efficiency of the fleet. Wal-Mart is the China of companies, so, explained Scott, “if we place one order we can create a market” for energy innovation.

For instance, Wal-Mart has used its shelves to create a huge, low-cost market for compact fluorescent bulbs, which use about a quarter of the energy of incandescent bulbs to produce the same light and last 10 times as long. “Just by doing what it does best — saving customers money and cutting costs,” said Glenn Prickett of Conservation International, a Wal-Mart adviser, “Wal-Mart can have a revolutionary impact on the market for green technologies. If every one of their 100 million customers in the U.S. bought just one energy-saving compact fluorescent lamp, instead of a traditional incandescent bulb, they could cut CO₂ emissions by 45 billion pounds and save more than \$3 billion.”

Those savings highlight something that often gets lost: The quickest way to get to the China price for clean power is by becoming more energy efficient. The cheapest, cleanest, nonemitting power plant in the world is the one you don't build. Helping China adopt some of the breakthrough efficiency programs that California has adopted, for instance — like rewarding electrical utilities for how much energy they get their customers to save rather than to use — could have a huge impact. Some experts estimate that China could cut its need for new power plants in half with aggressive investments in efficiency.

Yet another force driving us to the China price is Chinese entrepreneurs, who understand that while Beijing may not be ready to impose CO2 restraints, developed countries are, so this is going to be a global business — and they want a slice. Let me introduce the man identified last year by Forbes Magazine as the seventh-richest man in China, with a fortune now estimated at \$2.2 billion. His name is Shi Zhengrong and he is China's leading manufacturer of silicon solar panels, which convert sunlight into electricity.

“People at all levels in China have become more aware of this environment issue and alternative energy,” said Shi, whose company, Suntech Power Holdings, is listed on the New York Stock Exchange. “Five years ago, when I started the company, people said: ‘Why do we need solar? We have a surplus of coal-powered electricity.’ Now it is different; now people realize that solar has a bright future. But it is still too expensive. ... We have to reduce the cost as quickly as possible — our real competitors are coal and nuclear power.”

Shi does most of his manufacturing in China, but sells roughly 90 percent of his products outside China, because today they are too expensive for his domestic market. But the more he can get the price down, and start to grow his business inside China, the more he can use that to become a dominant global player. Thanks to Suntech's success, in China “there is a rush of business people entering this sector, even though we still don't have a market here,” Shi added. “Many government people now say, ‘This is an industry!’ ” And if it takes off, China could do for solar panels what it did for tennis shoes — bring the price down so far that everyone can afford a pair.

VI.

All that sounds great — but remember those seven wedges? To reach the necessary scale of emissions-free energy will require big clean coal or nuclear power stations, wind farms and solar farms, all connected to a national transmission grid, not to mention clean fuels for our cars and trucks. And the market alone, as presently constructed in the U.S., will not get us those alternatives at the scale we need — at the China price — fast enough.

Prof. Nate Lewis, Caltech's noted chemist and energy expert, explained why with an analogy. “Let's say you invented the first cellphone,” he said. “You could charge people \$1,000 for each one because lots of people would be ready to pay lots of money to have a phone they could carry in their pocket.” With those profits, you, the inventor, could pay back your shareholders and plow more into research, so you keep selling better and cheaper cellphones.

But energy is different, Lewis explained: “If I come to you and say, ‘Today your house lights are being powered by dirty coal, but tomorrow, if you pay me \$100 more a month, I will power your house lights with solar,’ you are most likely to say: ‘Sorry, Nate, but I don’t really care how my lights go on, I just care that they go on. I won’t pay an extra \$100 a month for sun power. A new cellphone improves my life. A different way to power my lights does nothing.’”

“So building an emissions-free energy infrastructure is not like sending a man to the moon,” Lewis went on. “With the moon shot, money was no object — and all we had to do was get there. But today, we already have cheap energy from coal, gas and oil. So getting people to pay more to shift to clean fuels is like trying to get funding for NASA to build a spaceship to the moon — when Southwest Airlines already flies there and gives away free peanuts! I already have a cheap ride to the moon, and a ride is a ride. For most people, electricity is electricity, no matter how it is generated.”

If we were running out of coal or oil, the market would steadily push the prices up, which would stimulate innovation in alternatives. Eventually there would be a crossover, and the alternatives would kick in, start to scale and come down in price. But what has happened in energy over the last 35 years is that the oil price goes up, stimulating government subsidies and some investments in alternatives, and then the price goes down, the government loses interest, the subsidies expire and the investors in alternatives get wiped out.

The only way to stimulate the scale of sustained investment in research and development of non-CO₂ emitting power at the China price is if the developed countries, who can afford to do so, force their people to pay the full climate, economic and geopolitical costs of using gasoline and dirty coal. Those countries that have signed the Kyoto Protocol are starting to do that. But America is not.

Up to now, said Lester Brown, president of the Earth Policy Institute, we as a society “have been behaving just like Enron the company at the height of its folly.” We rack up stunning profits and G.D.P. numbers every year, and they look great on paper “because we’ve been hiding some of the costs off the books.” If we don’t put a price on the CO₂ we’re building up or on our addiction to oil, we’ll never nurture the innovation we need.

Jeffrey Immelt, the chairman of General Electric, has worked for G.E. for 25 years. In that time, he told me, he has seen seven generations of innovation in G.E.’s medical equipment business — in devices like M.R.I.s or CT scans — because health care market incentives drove the innovation. In power, it’s just the opposite. “Today, on the power side,” he said, “we’re still selling the same basic coal-fired power plants we had when I arrived. They’re a little cleaner and more efficient now, but basically the same.”

The one clean power area where G.E. is now into a third generation is wind turbines, “thanks to the European Union,” Immelt said. Countries like Denmark, Spain and Germany imposed standards for wind power on their utilities and offered sustained subsidies, creating a big market for wind-turbine manufacturers in Europe in the 1980s, when America abandoned wind because the price of oil fell. “We grew our wind business in Europe,” Immelt said.

As things stand now in America, Immelt said, “the market does not work in energy.” The multibillion-dollar scale of investment that a company like G.E. is being asked to make in order to

develop new clean-power technologies or that a utility is being asked to make in order to build coal sequestration facilities or nuclear plants is not going to happen at scale — unless they know that coal and oil are going to be priced high enough for long enough that new investments will not be undercut in a few years by falling fossil fuel prices. “Carbon has to have a value,” Immelt emphasized. “Today in the U.S. and China it has no value.”

I recently visited the infamous Three Mile Island nuclear plant with Christopher Crane, president of Exelon Nuclear, which owns the facility. He said that if Exelon wanted to start a nuclear plant today, the licensing, design, planning and building requirements are so extensive it would not open until 2015 at the earliest. But even if Exelon got all the approvals, it could not start building “because the cost of capital for a nuclear plant today is prohibitive.”

That’s because the interest rate that any commercial bank would charge on a loan for a nuclear facility would be so high — because of all the risks of lawsuits or cost overruns — that it would be impossible for Exelon to proceed. A standard nuclear plant today costs about \$3 billion per unit. The only way to stimulate more nuclear power innovation, Crane said, would be federal loan guarantees that would lower the cost of capital for anyone willing to build a new nuclear plant.

The 2005 energy bill created such loan guarantees, but the details still have not been worked out. “We would need a robust loan guarantee program to jump-start the nuclear industry,” Crane said — an industry that has basically been frozen since the 1979 Three Mile Island accident. With cheaper money, added Crane, CO₂-free nuclear power could be “very competitive” with CO₂-emitting pulverized coal.

Think about the implications. Three Mile Island had two reactors, TMI-2, which shut down because of the 1979 accident, and TMI-1, which is still operating today, providing clean electricity with virtually no CO₂ emissions for 800,000 homes. Had the TMI-2 accident not happened, it too would have been providing clean electricity for 800,000 homes for the last 28 years. Instead, that energy came from CO₂-emitting coal, which, by the way, still generates 50 percent of America’s electricity.

Similar calculations apply to ethanol production. “We have about 100 scientists working on cellulosic ethanol,” Chad Holliday, the C.E.O. of DuPont, told me. “My guess is that we could double the number and add another 50 to start working on how to commercialize it. It would probably cost us less than \$100 million to scale up. But I am not ready to do that. I can guess what it will cost me to make it and what the price will be, but is the market going to be there? What are the regulations going to be? Is the ethanol subsidy going to be reduced? Will we put a tax on oil to keep ethanol competitive? If I know that, it gives me a price target to go after. Without that, I don’t know what the market is and my shareholders don’t know how to value what I am doing. ... You need some certainty on the incentives side and on the market side, because we are talking about multiyear investments, billions of dollars, that will take a long time to take off, and we won’t hit on everything.”

Summing up the problem, Immelt of G.E. said the big energy players are being asked “to take a 15-minute market signal and make a 40-year decision and that just doesn’t work. ... The U.S. government should decide: What do we want to have happen? How much clean coal, how much nuclear and what is the most efficient way to incentivize people to get there?”

He's dead right. The market alone won't work. Government's job is to set high standards, let the market reach them and then raise the standards more. That's how you get scale innovation at the China price. Government can do this by imposing steadily rising efficiency standards for buildings and appliances and by stipulating that utilities generate a certain amount of electricity from renewables — like wind or solar. Or it can impose steadily rising mileage standards for cars or a steadily tightening cap-and-trade system for the amount of CO2 any factory or power plant can emit. Or it can offer loan guarantees and fast-track licensing for anyone who wants to build a nuclear plant. Or — my preference and the simplest option — it can impose a carbon tax that will stimulate the market to move away from fuels that emit high levels of CO2 and invest in those that don't. Ideally, it will do all of these things. But whichever options we choose, they will only work if they are transparent, simple and long-term — with zero fudging allowed and with regulatory oversight and stiff financial penalties for violators.

The politician who actually proved just how effective this can be was a guy named George W. Bush, when he was governor of Texas. He pushed for and signed a renewable energy portfolio mandate in 1999. The mandate stipulated that Texas power companies had to produce 2,000 new megawatts of electricity from renewables, mostly wind, by 2009. What happened? A dozen new companies jumped into the Texas market and built wind turbines to meet the mandate, so many that the 2,000-megawatt goal was reached in 2005. So the Texas Legislature has upped the mandate to 5,000 megawatts by 2015, and everyone knows they will beat that too because of how quickly wind in Texas is becoming competitive with coal. Today, thanks to Governor Bush's market intervention, Texas is the biggest wind state in America.

President Bush, though, is no Governor Bush. (The Dick Cheney effect?) President Bush claims he's protecting American companies by not imposing tough mileage, conservation or clean power standards, but he's actually helping them lose the race for the next great global industry. Japan has some of the world's highest gasoline taxes and stringent energy efficiency standards for vehicles — and it has the world's most profitable and innovative car company, Toyota. That's no accident.

The politicians who best understand this are America's governors, some of whom have started to just ignore Washington, set their own energy standards and reap the benefits for their states. As Schwarzenegger told me, "We have seen in California so many companies that have been created that work just on things that have do with clean environment." California's state-imposed efficiency standards have resulted in per-capita energy consumption in California remaining almost flat for the last 30 years, while in the rest of the country it has gone up 50 percent. "There are a lot of industries that are exploding right now because of setting these new standards," he said.

VII.

John Dineen runs G.E. Transportation, which makes locomotives. His factory is in Erie, Pa., and employs 4,500 people. When it comes to the challenges from cheap labor markets, Dineen likes to say, "Our little town has trade surpluses with China and Mexico."

Now how could that be? China makes locomotives that are 30 percent cheaper than G.E.'s, but it turns out that G.E.'s are the most energy efficient in the world, with the lowest emissions and best

mileage per ton pulled — “and they don’t stop on the tracks,” Dineen added. So China is also buying from Erie — and so are Brazil, Mexico and Kazakhstan. What’s the secret? The China price.

“We made it very easy for them,” said Dineen. “By producing engines with lower emissions in the classic sense (NOx [nitrogen oxides]) and lower emissions in the future sense (CO2) and then coupling it with better fuel efficiency and reliability, we lowered the total life-cycle cost.”

The West can’t impose its climate or pollution standards on China, Dineen explained, but when a company like G.E. makes an engine that gets great mileage, cuts pollution and, by the way, emits less CO2, China will be a buyer. “If we were just trying to export lower-emission units, and they did not have the fuel benefits, we would lose,” Dineen said. “But when green is made green — improved fuel economies coupled with emissions reductions — we see very quick adoption rates.”

One reason G.E. Transportation got so efficient was the old U.S. standard it had to meet on NOx pollution, Dineen said. It did that through technological innovation. And as oil prices went up, it leveraged more technology to get better mileage. The result was a cleaner, more efficient, more exportable locomotive. Dineen describes his factory as a “technology campus” because, he explains, “it looks like a 100-year-old industrial site, but inside those 100-year-old buildings are world-class engineers working on the next generation’s technologies.” He also notes that workers in his factory make nearly twice the average in Erie — by selling to China!

The bottom line is this: Clean-tech plays to America’s strength because making things like locomotives lighter and smarter takes a lot of knowledge — not cheap labor. That’s why embedding clean-tech into everything we design and manufacture is a way to revive America as a manufacturing power.

“Whatever you are making, if you can add a green dimension to it — making it more efficient, healthier and more sustainable for future generations — you have a product that can’t just be made cheaper in India or China,” said Andrew Shapiro, founder of GreenOrder, an environmental business-strategy group. “If you just create a green ghetto in your company, you miss it. You have to figure out how to integrate green into the DNA of your whole business.”

Ditto for our country, which is why we need a Green New Deal — one in which government’s role is not funding projects, as in the original New Deal, but seeding basic research, providing loan guarantees where needed and setting standards, taxes and incentives that will spawn 1,000 G.E. Transportations for all kinds of clean power.

Bush won’t lead a Green New Deal, but his successor must if America is going to maintain its leadership and living standard. Unfortunately, today’s presidential hopefuls are largely full of hot air on the climate-energy issue. Not one of them is proposing anything hard, like a carbon or gasoline tax, and if you think we can deal with these huge problems without asking the American people to do anything hard, you’re a fool or a fraud.

Being serious starts with reframing the whole issue — helping Americans understand, as the Carnegie Fellow David Rothkopf puts it, “that we’re not ‘post-Cold War’ anymore — we’re pre-something totally new.” I’d say we’re in the “pre-climate war era.” Unless we create a more carbon-free world,

we will not preserve the free world. Intensifying climate change, energy wars and petro-authoritarianism will curtail our life choices and our children's opportunities every bit as much as Communism once did for half the planet.

Equally important, presidential candidates need to help Americans understand that green is not about cutting back. It's about creating a new cornucopia of abundance for the next generation by inventing a whole new industry. It's about getting our best brains out of hedge funds and into innovations that will not only give us the clean-power industrial assets to preserve our American dream but also give us the technologies that billions of others need to realize their own dreams without destroying the planet. It's about making America safer by breaking our addiction to a fuel that is powering regimes deeply hostile to our values. And, finally, it's about making America the global environmental leader, instead of laggard, which as Schwarzenegger argues would "create a very powerful side product." Those who dislike America because of Iraq, he explained, would at least be able to say, "Well, I don't like them for the war, but I do like them because they show such unbelievable leadership — not just with their blue jeans and hamburgers but with the environment. People will love us for that. That's not existing right now."

In sum, as John Hennessy, the president of Stanford, taught me: Confronting this climate-energy issue is the epitome of what John Gardner, the founder of Common Cause, once described as "a series of great opportunities disguised as insoluble problems."

Am I optimistic? I want to be. But I am also old-fashioned. I don't believe the world will effectively address the climate-energy challenge without America, its president, its government, its industry, its markets and its people all leading the parade. Green has to become part of America's DNA. We're getting there. Green has hit Main Street — it's now more than a hobby — but it's still less than a new way of life.

Why? Because big transformations — women's suffrage, for instance — usually happen when a lot of aggrieved people take to the streets, the politicians react and laws get changed. But the climate-energy debate is more muted and slow-moving. Why? Because the people who will be most harmed by the climate-energy crisis haven't been born yet.

"This issue doesn't pit haves versus have-nots," notes the Johns Hopkins foreign policy expert Michael Mandelbaum, "but the present versus the future — today's generation versus its kids and unborn grandchildren." Once the Geo-Green interest group comes of age, especially if it is after another 9/11 or Katrina, Mandelbaum said, "it will be the biggest interest group in history — but by then it could be too late."

An unusual situation like this calls for the ethic of stewardship. Stewardship is what parents do for their kids: think about the long term, so they can have a better future. It is much easier to get families to do that than whole societies, but that is our challenge. In many ways, our parents rose to such a challenge in World War II — when an entire generation mobilized to preserve our way of life. That is why they were called the Greatest Generation. Our kids will only call us the Greatest Generation if we rise to our challenge and become the Greenest Generation.

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