

ENVIRONMENTALLY SPEAKING

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Continued energy woes or a secure energy future?

by Peter Schwartzman and Tim Montague

Literally everything we do requires energy. Even sitting still requires energy because our heart still pumps blood, and our internal thermometer must work to maintain a constant, livable temperature. Internal human processes aside, our species has learned to use energy for external activities on a grand scale. The technological age has brought us a slew of gadgets to improve our lives — televisions, refrigerators, cell phones, automobiles, lawn mowers, and more. Given the extent to which energy consuming machines dot our landscape, it's no surprise to find that human energy use increased considerably during the 20th century. During the last century, total global energy use went up 12 times and per capita energy use went up nearly 4-fold. As poorer countries like India and China continue to industrialize, this trend will continue.

Prior to the 19th century, humans relied on renewable resources (wood, whale oil, crops, etc.) to produce materials for commerce, transportation, and food. Today we rely heavily on non-renewable energy forms like oil, coal, and nuclear power. In the Midwest we currently meet 95 percent of our electricity needs with coal and nuclear power. Similarly, oil provides the vast majority of our transportation fuel — 70 percent of which we import from overseas. Unfortunately, the social, political and economic costs of our dependence on oil, coal and nuclear are quickly adding up.

As we begin a new century, the questions become: "Is there a better way to maintain our standard of living?" and "What energy alternatives do we have that maximize the benefits and minimize harm to human health and the planet?" It's ironic that the lifeblood of our economy and high standard of living are also the source of our deepest national health, environment and security challenges. You don't have to be an American soldier in Iraq to know that something is seriously wrong with our national energy policy.

Air pollution from fossil fuels is a serious problem for human health and increasingly the health of the planet. Pollution from fossil fuels kills 30 to 60 thousand people in the U.S. each year. That's the death toll from a Vietnam-sized war each year. Global warming, the other major side effect caused by burning fossil fuels is jeopardizing entire regions — like the Gulf Coast — with flooding. And then there is nuclear power. We don't know what to do with the radioactive waste. It's just piling up by the train car-load as we debate where and how to bury it. Worse yet, nuclear power requires weapons-grade plutonium that can be used by terrorists or rogue governments to wreak havoc on their enemy of choice.

Here in Illinois our 25 coal-fired power plants are chugging tons of soot, smog and mercury into the air 365 days a year. This pollution causes 1,356 excess deaths, 2,361 heart attacks and 33,986 asthma attacks each year according to the Environmental Protection Agency. This translates into millions of dollars of lost worker productivity, healthcare expenses and missed days of school. As a nation we are now spending 15 percent of our Gross Domestic Product taking care of sick people — money that could be better spent creating living-wage jobs and high-quality education for our youth.

The environmental and health-related costs of coal-mining (and uranium mining for nuclear power) are tremendous. Miners are exposed to many occupational hazards, not the least of which is breathing coal or uranium dust. Illinois' coal reserves are larger than those of any state east of the Mississippi River and the third largest in the country.

behind only Montana and Wyoming (ISGS). But mining the coal tears up thousands of acres of land that would otherwise have been green space or productive farmland. The resulting erosion and loss of wildlife habitat are a major detriment to the local residents' quality of life (Howard).

Global warming's clear signal

Thanks to hurricane Katrina — and its landmark \$200 billion cleanup costs — and regular coverage by *Time*, *Newsweek*, and the *New York Times*, global warming has become a household expression. NASA scientists believe that we've reached a global tipping point beyond which it will be very difficult to reverse course. As the planet warms there is less snow and ice to reflect back the heat of the Sun and so the warming trend will grow stronger. They warn that if we don't drastically reduce our global greenhouse gas emissions, temperatures will rise by 3 to 10 degrees Fahrenheit by 2100. That translates into an uncertain future of droughts, storms, floods, and pestilence (owing to the emergence of new zones of habitability for disease-carrying organisms).

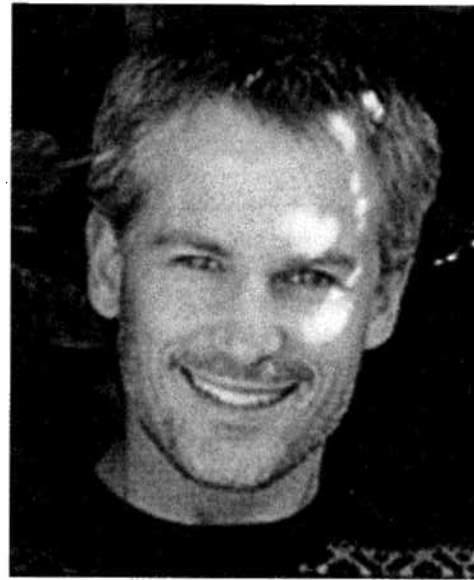
Al Gore's "An Inconvenient Truth" makes it plain to see that our oil-and-coal-rich lifestyle is melting ice caps, creating stronger hurricanes, and raising sea levels. The dangers are clear and present. Hurricane Katrina displaced over 1 million people in Louisiana alone. The truth is: global warming has already begun to transform life on Earth as we know it. A year after Katrina, New Orleans has returned to less than half of its original population. And there are 35 million Americans living in the hurricane-prone coastal region of the U.S. from the Carolinas to Texas — sitting ducks for the next big one.

The dark side of nuclear power

Safety reviews conducted this past March revealed that radioactive water from Braidwood and other Illinois nuclear power plants had leaked into local groundwater supplies. The attorney general of Illinois announced she was filing a lawsuit against Exelon Corporation because of six such leaks, demanding that the utility provide substitute water supplies to residents. Home to eleven nuclear power plants (the most of any state in the country), Illinois currently generates more than half of its electricity from nuclear power. The Chicago region gets as much as 80 percent of its juice from nuclear power.

Once promised to produce electricity "too cheap to meter," nuclear power has not lived up to its expectations. Proponents argue that nuclear is THE answer to global warming and weaning the U.S. off of foreign oil. But there is a simple reason no nuclear power plants have been built in the last twenty five years in the U.S. — they aren't economical. And they are so dangerous that no insurance company will underwrite them, forcing Uncle Sam to manage that unwanted liability (as stipulated in the Price-Anderson Nuclear Industries Indemnity Act). Nuclear power plants are hugely complicated, expensive machines that produce radioactive waste which has to be securely stored for thousands of years. Now we have a fleet of aging nuclear power plants (and heaps of radioactive waste) approaching the end of their useful life and industry is lobbying hard to build a next generation — but only with billions in federal subsidies paid for with taxpayer dollars.

Nuclear power plants pose a number of threats. The power plants can melt down spewing radioactive dust into the air. Chernobyl-style events can occur through human error or terrorist attacks. From cradle



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to grave, the fuels used in nuclear power plants are extremely dangerous, difficult to contain, and so long-lived that humans really don't know how to grapple with the waste problem.

The most serious weakness of nuclear power is the weapons-grade plutonium that is made to fuel nuclear reactors. Where there is plutonium, there will be nuclear weapons. Be it Pakistan, India, Israel, and soon Iran, the path for acquiring nuclear weapons capability is clear. And of course that technology will spread to the highest bidder on the world market and it's not a matter of if, but when, a U.S. city (or another major urban center in the world) is the target of a terrorist attack with a nuclear bomb that will make 9/11 look like child's play.

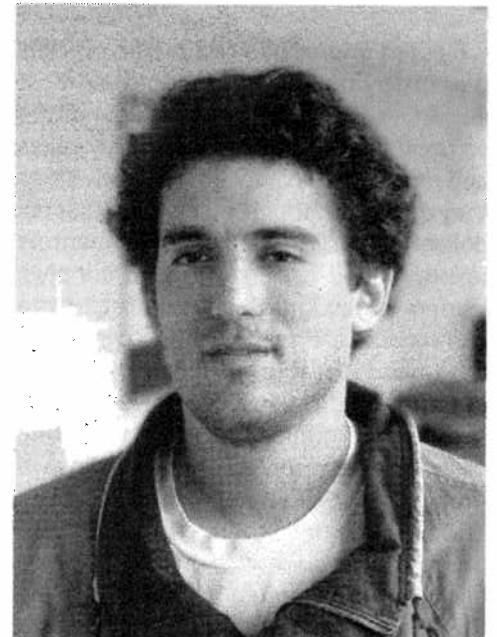
Oil and war

Americans love their automobiles and so long as the gasoline flows cheaply, we don't seem to have a problem. But the true costs of importing 70 percent of our oil — much of that from the Middle East — are much greater than the price we pay at the pump. Our military presence in Iraq and Afghanistan is a thinly veiled part of a bigger long term presence designed to secure access to oil imports. So long as we need large quantities of oil, we will be entangled in that region. We have to ask ourselves, is the \$310 billion (and counting) investment in Iraq worth it just to keep the "cheap" oil flowing? Imagine what we could do with all that money right here at home.

Isn't it time to ask whether a better way is possible? Do we accept these problems as necessary costs for all the "fruits" that have come with modern industrialization? Must we be so cynical, so unimaginative? What kind of society do we want to live in anyhow?

Current discussions around what energy source we should use focus almost entirely on a limited definition of cost. For instance, coal and nuclear are often touted as lower cost solutions than renewable sources like wind or solar. There is the purely dollars and cents cost that the consumer pays. But there are many factors including environmental damage, negative impacts on human health, and taxpayer subsidies that are often overlooked. So the current, seemingly fair and objective, comparison of energy sources on the basis of "cost" is contrived and virtually meaningless. Yet, the beat goes on, and on, and on.

But, the beat stops here. There are social and ethical considerations. Even if a "true" cost could be calculated, there are many important factors that need investigation: (1) Is the resource available in sufficient quantities now and in the future?; (2) Does the energy source support democratic principles and improve chances for a peaceful world?; (3) Is the source climate neutral?; and, (4) Is the technology safe and does it promote national security? These



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concerns cut to the heart of the matter. Let's address them briefly.

Given that global energy consumption is now only 0.01 percent of what the sun delivers to Earth, there is no question about sufficient quantities. Even with anticipated growth in energy consumption this century, we have a long way to go before we approach natural limits — interestingly, the same cannot be said for water, soil, or clean air resources which are currently being exploited beyond their renewal capacity. If you consider that fossil fuels are just the sun's energy from many millions of years ago, our current energy program can be thought of as "ancient" or "antiquated" and certainly not "modern" or "contemporary."

Regarding democracy and peace, energy sources that are more equitably distributed — unlike oil, coal and nuclear fuels which are concentrated in a few countries — will reduce friction in international politics. Solar, wind and geothermal energy sources are much more equally distributed, promoting local self-reliance and decision-making. As for the "global warming" implications of energy resources, renewable energy sources are much less impacting in this respect. Given the gravity of impending climate change (on all life forms), this factor will be ignored at our collective peril.

Lastly, regarding safety, as recent blackouts have suggested, modern 'centralized' energy distribution networks are not reliable. Networks of large coal, natural gas and nuclear power plants are inherently vulnerable to natural and manmade (terrorist) disasters. Renewable energy sources decentralize production much more readily and, therefore, are inherently safer.

Clean, renewable energy

Just a few weeks ago 64 local mayors, scientists and civic leaders from the Chicago area sent a letter to Springfield demanding the Illinois Legislature take proactive steps to address global warming. The letter calls for meeting 20 percent of our energy needs in Illinois with renewable sources by 2020. To some this might sound like a big step, but leading energy researchers conclude that the U.S. could achieve a 100 percent renewable energy economy by 2020 — it's simply a matter of priorities. The country of Sweden has taken a bold step in that direction pledging to be oil-free by 2020.

Renewable energy sources include wind, solar, hydropower, biomass, geothermal and wave energy. Wind energy is the fastest growing source of electricity in the world today. It's growing faster than coal, nuclear and natural gas with an annual growth rate of 34 percent. Machines that harness the wind's energy have been in use since Roman times (~200 B.C.). The first windmill for electricity production was installed in Denmark in 1891. It was a small

rope is the world leader in wind power. Denmark leads the world making 23 percent of electricity from wind, followed by Spain at 11 percent and Germany at 4 percent. Here in the U.S. we now generate just 0.5 percent of our electricity with wind. But there is hope — we have only scratched the surface of wind's huge potential in America.

If we harnessed just 10 percent of the wind potential of the ten windiest American states we could reduce total U.S. carbon emissions by a third. A Department of Energy study concluded that we could meet all our electricity needs if we harnessed the wind resources of just three states — North Dakota, Texas and Kansas. In 2005, wind energy became cheaper than natural gas-fired power (even using a contrived determination of "cost") setting off a wind-energy buying bonanza. Wind-turbine production is now sold-out through 2008 in the U.S. — we're talking about a \$7.5 billion dollar industry by 2010.

Wind energy is abundant, renewable, widely distributed, clean, and mitigates global warming. Meanwhile, current tax code provides that non-renewable energy sources receive 96 percent of all tax subsidies. Federal subsidies for all renewable energy over the last fifty years are about \$8 billion or \$160 million/year. Compare this to \$142 billion for nuclear or the tens of billions per year that the coal and oil industry receive in federal subsidies. Clearly the playing field is uneven.

Solar — pure light

The amount of solar energy striking the surface of the earth is enormous. More energy strikes the earth in ONE HOUR than all of humanity consumes in a year. Even taking into account seasonal and geographic variation, putting solar cells on our rooftops makes perfect sense. The Energy Foundation (www.ef.org) estimates that we could generate half of all our electricity needs just by putting solar cells on all existing rooftops in America.

We can convert sunlight directly to electricity with "solar cells," also called photovoltaic cells" or PV for short. Production of photovoltaics is up 25 percent in the past decade and up 45 percent in 2005; most are made in Japan (Kammen). We can also convert sunlight to heat energy by heating water (or some other heat-trapping liquid), making steam, and then using that steam to make electricity. This so-called solar-thermal" technology can be as simple as running water through an array of pipes painted black which warms the water. The bottom line is you can generate large quantities of electricity and heat for a variety of household or commercial uses.

The only technical challenge with wind and solar is energy storage — we have to efficiently store the energy captured from wind and solar because neither source is available 24/7. You can store electricity from wind farms or solar cells by pumping water or compressed air into tanks for later release (the stored water or air drives a generator to make electricity). Or you can store the energy as hydrogen.

Hydrogen can be used to power electric fuel-cell vehicles. This process is entirely clean and climate neutral — water is the only byproduct. Fuel-cell vehicles are already entering the commercial marketplace and with proper R&D investment there is a bright future for clean-air highways.

Corn Oil & Biofuels?

Biomass energy — making fuel or electricity from crops — is now getting a lot of attention here in the Corn Belt. Your neighbor could be filling up her tank with biodiesel made from recycled french fry grease or ethanol made from corn or soybeans. But, even if we dedicated all current U.S. corn and soybean production to biofuels, we would only be able to meet 12 percent of gasoline demand and 6 percent

of diesel demand" (Choi). This is probably isn't the best use of corn and soy given the importance of these crops to our food supply.

Biomass doesn't solve our environmental woes the way wind and solar do and should be seen as a transitional technology. When you consider the fossil fuels (to run tractors), and the pesticides and fertilizers used to grow soy and corn, converting crops to fuel is less than climate neutral and far from environmentally benign. Low-till or no-till crops like switchgrass (a native prairie grass) are probably a better long term solution than soy or corn. Done right, biomass can be a part, albeit small, of our renewable energy strategy.

Geothermal — using the heat energy in the earth to heat or cool buildings or produce electricity — is also a highly distributed and renewable resource. For small and medium-scale applications like keeping your house or office building warm in the winter or cool in summer — geothermal is a great renewable energy source.

Efficiency and Conservation

No future energy policy can overlook the huge amounts of energy that goes to waste in our society. On average, our buildings are far too leaky, our electronics far too numerous and gluttonous, and our transportation options too few and ill-conceived. A perfect example of the absurdity of the way we waste energy is the fact that ~5 percent of all household energy in the United States is used to run televisions, computers, and similar appliances when they are **off** (Lovins)!

There are far better ways to build our homes and machines and far smarter and more responsible ways to transport ourselves. In Ludwigshafen, Germany, 500 homes were retrofitted with known technologies and energy demands were reduced by 83 percent (Jochem). There is nothing shocking about this. It just requires thought and execution. Small changes in consumer choices can also have an astounding impact. Modern refrigerators use only one-fourth of the energy they did 30-years ago and tremendous amounts of pollution has been avoided. But further reductions are still possible (especially with home electronics where efficiency is currently not a line item). The expansion of subway lines and bikeways, and a shift away from SUVs to LEVs (low-emission vehicles) can be extremely beneficial to our energy woes as well as our air quality. Changes in household efficiency will save a great deal of energy (and at less cost than coal (Lovins)) and modifications to existing transportation options should also make a huge dent as well.

J-O-B-S

One of the most effective ways members of the powerful energy conglomerate (and their minions) convince the citizens that renewable forms of energy won't work on the large scale is by floating and reaffirming the myth that too many jobs will be lost if we move away from fossil fuel-based economies. Unfortunately, as in other proclamations they make, these allegations are unfounded and, in fact, when one analyzes what will happen when we do make this move (and it will happen soon, smoothly or with them kicking and screaming), it is found that actually renewable energies demand a greater workforce and one that will be compensated well. According to the Union of Concerned Scientists, renewable energy and energy efficiency delivered on a grand scale has the potential to "create 1.3 million jobs in this country by 2020" (RMI). A study published last year by IL-PIRG shows that a program to move IL to 20 percent renewable by 2020 would result in a net increase of jobs by 4,600-7,600 a year (and save consumers \$794 million on natural gas bills by the end date!) (Redirecting). These studies and

others suggest that we should be ultra-careful not to fall victim to the "loss-of-jobs" myth perpetuated by industry.

With all this potential for changing to safe, reliable, peaceful and clean energy, and reducing waste while increasing jobs, it boggles the mind why we aren't half way there yet. Unfortunately, human greed (of a few) and the collective ignorance (of the many) is a big reason why.

Today, most energy resources are largely monopolized by a few extremely wealthy companies. Oil is probably the best example of this — Exxon-Mobil, BP, and Shell control the lion's share of the world's oil. The combined profits of these three companies total more than \$80 billion per year. That's an \$80 billion disincentive to promote and develop renewable alternatives. There is substantial evidence that major energy companies have stifled entrepreneurial efforts to develop and distribute renewable energy by buying out smaller innovators in the field.

Big oil's influence in politics, too, is plain to see. It is no surprise that three key members of the current administration are connected to the oil industry — President George Bush (Arbusto), Vice President Dick Cheney (Halliburton, the largest oil-services company), and Secretary of State Condoleezza Rice (Chevron). It is well-known that Republican candidates received 80 percent of the campaign contributions (nearly \$26 million) made by the energy industry leading up to the 2004 election (Blackout). Is there any doubt why most of our politicians are ineffective at tackling the health, environmental and security issues so closely tied to coal, nuclear and oil?

The sheer volume of renewable energy availability means that it will not be ignored — we could meet current global energy demands 17 times over using clean energy alternatives. But the public needs to say "No" to more government subsidies to fossil fuel and nuclear industries. And we must support R&D investment in cleaner, safer technologies like wind and solar — a real investment (unlike military spending) in national security.

Consumers could demand clean energy alternatives and force the energy industry to move much faster on renewable energy initiatives. But let's face it. Until consumers really understand that there are viable alternatives to coal, oil and nuclear, little change is likely. A better informed public means better public education that includes energy issues in the schools and in the media. We need to take back the airwaves — a vibrant and independent (not corporate dominated) media is critical to open democratic debate about the energy issues and alternative choices we face. And we need real campaign finance reform to insure

that law-makers can invest the necessary federal dollars in renewable, sustainable, peaceful, and clean energy programs. These steps won't happen without persistent, organized action by caring, and creative residents. A different future is possible, and it is time that we all pitched in to make it bright.

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