RENEWABLE AND UNCONVENTIONAL ENERGY FOR A SUSTAINABLE FUTURE: CAN WE CONVERT IN TIME?

Brian, O'LEARY
drbrianoleary@gmail.com

ABSTRACT: Renewable energy now comprises about 7 per cent of the world's energy mix. Nuclear power consumes another 5 per cent, but is radioactive, vulnerable and expensive. The remaining 88 per cent comes from burning nonrenewable oil, coal and natural gas, all of which inject vast amounts of carbon dioxide into the atmosphere. Climate scientists are now making an urgent call to reduce global carbon emissions by as much as 90 per cent during the coming decades. A steep increase in the use of renewables will become necessary to meet current and projected energy demands. But the existing renewables (solar, wind, biomass, hydroelectric, geothermal, etc.) each have their limitations, and so we will also need to turn towards true innovation in our energy practices and infrastructures worldwide. Research and development on advanced, unconventional renewables has thus far been suppressed by very powerful interests. However, new policies could quickly reveal that vacuum (zero-point) energy, cold fusion, advanced hydrogen and water chemistries and other novel approaches can lead to a quantum leap in having a clean, cheap, safe, decentralized energy future. New energy technologies may be our only lasting hope to reverse the global climate crisis. We must therefore support the responsible development of these sources for a sustainable future Earth.

1. INTRODUCTION

Thank you for this opportunity to share some information and thoughts about renewable and innovative energy sources. It is especially an honor to have this chance towards an objective look at the full range of options available to us and to think deeply and honestly about what kinds of energy we would really like to have for an environmentally clean and affordable future for all of humanity.

Especially in East Asia, with its steady economic growth and a robust intellectual and manufacturing capacity, it is possible to select from many energy options for the future. Sometimes, however, these choices are very difficult to evaluate because of the tremendous imperial, military and mega-corporate control of our global energy policies, as well as the promotional biases of those financially vested in each source. It can get very confusing when we hear of "clean coal", "sustainable biomass", "safe nuclear" and other such attributes that may not be really true in the long run. What are touted as innovative or breakthrough technologies might turn out to be only incrementally beneficial, at the very best.

Ideally, we all want to be able to use energy sources which are clean, cheap, safe, decentralized and publicly transparent--for the benefit of all humankind. But an honest assessment of these qualities requires the study of the full life-cycle environmental and economic costs and benefits of each option. This, then, becomes a complex job of assessing the full implications of the pervasive deployment of each option in various regions of the world. While I will only touch on the most basic aspects of new and renewable energy, this kind of deep study does need to be done for each locale in order to make the wisest choices. [1, 2] No subject, besides the creation of international peace and justice, deserves a more careful look than the environmental impact of ways in which we generate and use energy. This is an issue that profoundly affects all of us and future generations. We must act soon!

What is most disconcerting to all of us here today is the alarm now being sent out by the international climate science community to drastically cut our carbon emissions. As an atmospheric and energy physicist myself, I am particularly aware of the tremendous burden posed by our collective burning of nonrenewable fossil-fuel hydrocarbons found in the ground - oil, coal and natural gas. The overwhelming consensus of thousands of climate scientists is that our collective routine use of transportation systems, power plants and heating-cooling-cooking-burning practices are now producing more greenhouse gases than we can tolerate to maintain a stable climate.

The predictions are grim. In their 2007 report [3], the scientists on the Intergovernmental Panel on Climate Change (IPCC) show that, at our current and projected rate of greenhouse gas emissions, we will melt the icecaps, glaciers and permafrost, causing significant rises in sea level. Melting the Greenland ice sheet alone could raise sea levels by several meters, inundating most coastal populations on Earth. The predicted global warming will create more and more deserts, superstorms, droughts, fires, floods, heat waves and water supply shortages. They will deflect disease vectors northwards, create mass migrations away from the most affected areas, and will kill more and more species, including life in the ocean as it becomes ever more overfished and acidic.

Within decades, these effects will be so physically and economically catastrophic, most or all of us may not be able to survive this. Even if we were to immediately cut to zero these emissions, the existing imbalance of carbon dioxide in our atmosphere will go on for more than fifty years, sea levels would not go down for at least another 1000 years, so a lot of the damage is already done and will continue to be done in the foreseeable future. Nobody knows for sure how soon or by how much all this will happen or whether we have already reached a "tipping point", but it would seem, at the very least, we must change our energy practices as a precautionary measure.

Many of our leading spokespeople such as Al Gore [4] and George Monbiot [5] have proposed that we shall have to reduce our carbon emissions by 70-90% or more by 2050 to have any chance to survive the positive feedback loops of runaway global warming. [6] But the reality of our times shows an increase, not a decrease, of our total fossil fuel combustion. The Kyoto Protocols to limit emissions have been ignored by some nations, sadly including the United States, yet even that modest measure appears to be too little too late to avoid a climate catastrophe. These are very real physical problems mandating physical solutions which need to lie outside fossil fuels if we are to meet even our current energy demands, let alone future demands as growing economies such as those of Korea, Japan and China seek to use more energy. Hopefully this increased energy production should be free of imported oil and also create the least amount of emissions.

There are also serious economic challenges coming from the non-renewablity of oil, natural gas and water. Many financial and academic experts have predicted drastic price increases and conflicts because of dwindling supplies. [7] They believe we are now approaching peak oil and gas production, in which half the amount of total known global supply has already been used, with steadily increasing prices to come.

This perception of scarcity also creates international tensions, as the U.S. and its allies go to war simply to secure their thirst for oil. This problem can get only worse in time, unless we act soon. The American energy scientist Michael T. Klare [8] has even suggested that, as oil and other basic fuels become ever more depleted, the competition for the remaining resources is creating what he calls petro-fascism, a kind of totalitarian control not only of the fuels but of our very freedoms. I am embarrassed to admit that the U.S. leads the way down this destructive path. The picture is grim and so the energy choices we make now will have profound impact on our collective future.

Nuclear power in an electrified economy has also been proposed as a major energy option to help mitigate global warming. [9] But the questionable safety, vulnerability and great expense of these central station plants also raise serious questions about our collective future. The problem of the disposal of long-lived high-level radioactive waste is still not solved, exposing ourselves and untold future generations to fallout. Moreover, the proliferation of the technology poses big problems as nuclear materials find their way into the wrong hands. Anyone could, in principle, adapt these fuels to doomsday weapons, a problem I'm sure is familiar to many people.

Because of dwindling uranium supplies, the possibility of making nuclear power more renewable by building breeder reactors can only increase the dangers of proliferation because the fuel produced and recycled into the reactor is highly radioactive weapons-grade plutonium.

Centralized nuclear "hot" fusion reactors are not yet proven in spite of tens of billions of dollars already spent, and are unlikely to solve the issue. These plants would have to be enormous and therefore be vulnerable to sabotage and failure. The nuclear path would also have to rely on antiquated, costly and unsightly grid systems.

2. EXISTING RENEWABLE ENERGY

The only remaining choices to consider for our energy future are the renewable - hydropower, geothermal, biomass, solar thermal, solar electric, wind, tides, waves, ocean - thermal-gradients, and new, unconventional technologies such as vacuum (zero-point) energy, low-temperature nonradioactive nuclear reactions ("cold" fusion), and advanced hydrogen and water chemistries. During the rest of this work I will very briefly discuss each of these options for their potential in a mix of future energy choices.

Renewable energy is a bit of a misnomer. In principle, a renewable energy source is one which is always replaceable. For example, solar energy is renewable only as long as the sun shines, wind energy is renewable as long as the wind blows, hydropower is renewable as long as the water flows, biomass is renewable if we can keep growing new, dedicated crops, etc. However, a renewable source can be dirty, expensive and unsustainable when we consider its full life-cycle environmental impact, one in which the costs are not externalized. Therefore I prefer the term sustainable energy as a more important objective than renewable energy. Sustainable energy is both clean and renewable.

The existing conventional renewable energy sources are as follows:

Hydropower. Currently, about 3% of the world's energy is generated by hydropower, or falling water which turns turbines at the bottom of dams to generate electricity. If global energy demand increases, it is unlikely that hydropower's contribution to the total electricity use will be much more than it is. This is because, most of the great rivers have already been tapped for many uses, and some don't even reach their mouths. Also, the trend now is to destroy old dams rather than build new dams because of their negative environmental impact. For example, in the U.S. now, many dams are being destroyed to make way for the salmon to once again be able to swim upstream to spawn and thus avoid their own extinction.

Geothermal. Some areas have a considerable heat supply beneath the Earth, for example in Iceland. About 0.4% of the world's energy supply is geothermal. As in the case of hydropower, we are unlikely to find enough resource to be able to increase its contribution to growing global energy demand worldwide.

Solar thermal. Concentrating mirrors can focus solar energy onto pipes to heat water or for cooking or for generating electricity. Buildings with glass facing South (in Northern Hemisphere winter) can also be heated passively by sunlight. These technologies have been with us for a long time, and have many advantages, particularly in sunny areas, because of their low cost and decentralized qualities. But the share of this approach to the total global energy mix is not expected to increase much because of limited site suitablility, land-and-materials intensity, the intermittency and diffusesness of sunlight, and the need for bulky storage systems if we want base-load (continuous) power.

Solar photovoltaics. Currently, specially-prepared silicon solar collectors can convert sunlight into direct current electricity. These cells have many of the same problems as solar thermal collectors: site sensitivity, diffuseness, intermittency, and materials-capital-and-land intensity for collection and storage. However, promising research in photovoltaic thin films could lower this cost appreciably and could make it competitive for certain local uses of non-baseload electricity. Solar-generated electricity can also be placed into a grid system so that it could supplement baseload power during daytime in certain regions. At the moment, all forms of solar energy comprise less than 0.1 % of global energy demand, but its proportion could increase depending on the choices we make for the future.

Wind power. Generating electricity from wind turbines is on the increase globally. It too is renewable yet limited, depending on the amount of wind available, and therefore has many of the same kinds of advantages and disadvantages as solar electricity. In Denmark and Germany, especially, wind power is quite cost-competitive and cleaner than burning fossil or nuclear fuels. But even there, we run into some of the same limitations posed by the other renewables: materials-and-land intensity, site sensitivity, diffuseness, intermittency and ugliness. Wind power now consumes almost 0.2 % of global energy demand, and could increase, again depending on the choices we will need to make.

Biomass. Recently, there has been a push to develop ethanol from corn and other crops. As additives in gasoline, these fuels have generated marginally fewer greenhouse gases, because some of the carbon dioxide produced by burning these carbohydrates can be absorbed within a new crop, and is therefore partially renewable. However, the ethanol-from-corn option suffers from requiring a large fossil fuel infrastructure to harvest, transport and store it. Biofuels also compete with agriculture for dwindling land space. Soil can get depleted and carbon is still injected into the atmosphere. Biomass contributes about 3% of global energy demand, mostly for industrial and residential use and for ethanol and biodiesel for transportation.

Tides, waves, and ocean thermal gradient power. Each of these options, not yet developed, could provide a small fraction of the total mix. Again, we have the problems of materials intensity and water use, site suitability and diffuseness.

Hydrogen. Nowadays we hear often about the potential of hydrogen to produce electricity in fuel cells or to be burned as a fuel. But hydrogen is not an energy source, it is an energy carrier. For most applications, it takes more energy to produce hydrogen than it yields, for example, in the electrolysis of water. Hydrogen is also difficult to transport and store. On the other hand, a centralized hybrid system of solar-hydrogen energy has been proposed as one possible solution to replace fossil fuels and nuclear power to meet global energy demand. [10] Nevertheless, the grid-and-pipeline infrastructure and land-use requirements are very great, unless we can produce the hydrogen using clean unconventional energy sources such as those described below.

Summary of the traditional renewables. The above described renewable energy systems can fill some of the gaps in energy supply in some regions, but cannot fill the entire global energy demand. After years of study, I have reluctantly come to this conclusion. There simply is not enough resource, land, materials or reliability to replace fossil fuels and nuclear energy to the degree hoped for, using today's technology. Many scientists have come to the same unhappy conclusion: Richard Heinberg [11], James Lovelock [9], John Holdren and Nathan Lewis [12], for example. Lovelock has gone so far as to suggest we must return to nuclear power, because we have no other choice. Table 1 summarizes those nonrenewable and conventional renewable energy technologies which are currently known and supported by the governments and industries worldwide.

Table 1. Existing or well-researched nonrenewable and renewable energy generation technologies and their current (and projected for the foreseeable future) contribution to the global energy mix.

Nonrenewables (93%)		**Renewables (7%)**	
39%	Combustion of petroleum-based fuels	0.2%	Wind-based generation systems
24%	Combustion of natural gas	0.1%	Solar-based heating and power generation systems
24%	Combustion of coal and its derivatives	0.4%	Geothermal-based heating and power generation systems
	Hydrogen derived from petroleum, natural gas, or coal	1%	Biofuels (ethanol and biodiesel)
5%	Uranium and plutonium fission-based nuclear reactors that are highly radioactive	2%	Biomass combustion (mostly wood chips)
	"Hot fusion" (Tokamak-related) technologies supported by the U.S. Department of Energy research programs		Fuel cells
			Tidal or wave energy electrical generators
			Thermal gradient-to-electricity processes, including ocean thermal energy conversion
			Anaerobic digestion of waste to biogas
		3%	Conventional hydroelectric generators
			Any other technologies currently supported by existing research programs

Author George Monbiot [5] agrees that none of the above technologies can satisfy global energy demand and that a cut-back of 90% of our hydrocarbon energy use over the next 25 years will become necessary, requiring extreme sacrifice alongside localized improvements in efficiency and the use of renewables. He has suggested that everyone on Earth be given a carbon emissions quota that is drastically less than is now consumed by the more affluent users. In some cases there appears to be no solution, such as carbon emissions from air travel.

Therefore, in my opinion, we must now turn to the potential of innovation to solve this vexing problem, which seems to suggest that, while a degree of improvement is possible by using locally available renewables and improving the efficiency of our energy systems, no one solution is really satisfactory to deliver anything truly clean if our energy appetite were to continue even at its current level. Fortunately, such a set of solutions does appear to exist but has been suppressed for decades. It is almost heresy to imagine supplanting the world's first and only multi-trillion dollar economy vested mostly in fossil fuels. Yet this is what we might have to do to survive the climate crisis.

3. UNCONVENTIONAL RENEWABLE ENERGY

The lasting solution to the energy crisis appears to be new or unconventional ("free") energy, which promises a quantum leap in our ability to tap clean, cheap, renewable, decentralized, safe and sustainable energy for the whole planet, thus ending the nightmares of climate change, pollution, oil wars, resource depletion, nuclear proliferation, poverty and water shortages ("free"energy could desalinate sea water).

Over the past fifteen years, I have made an intense, personal study of the potential of new energy. I traveled the world and visited some of the best and brightest scientists in the field. [2, 13] Surprisingly, I have found proofs-of-concept of many technologies. With a modicum of R&D investment, new energy could be developed and deployed within the next ten years. This would be a great project for governments and industries!

When full life-cycle environmental costs are considered on a global scale, none of the existing nonrenewable and renewable energy technologies appear to meet the criteria of sustainability-absent a breakthrough. By choosing selected traditional renewables in favorable areas, we could only hope for incremental changes in our energy supply in the face of accelerating global demand. More importantly, these alternatives do not address the urgent mandate for clean energy needed to mitigate global warming.

On the other hand, many new energy technologies have already been proven in hundreds of laboratories scattered throughout the world. [14] Any one or some of these approaches, if properly developed, could end our dangerous dependence on hydrocarbons and uranium. Clearly the traditional technologies keep us mired in the nineteenth and twentieth centuries rather than launching us forward into the twenty-first century. But this conventional thinking continues to dominate the news these days. Despite the great need, suppression of new energy has been historically documented in great detail by those who have taken the time to investigate. [2, 13] Inventors have suffered funding cuts, threats, sabotage and even assassination ever since the time of Nicola Tesla more than one century ago.

We define “new energy” to generally mean innovative technologies with the potential of providing a quantum leap in our ability to tap cheap, clean, safe and decentralized energy for producing fuels and electricity. These may or may not be recognized by mainstream science. The technologies include:

ADVANCED HYDROGEN TECHNOLOGIES (1) catalytic water molecule manipulation and dissociation through cheap electrolysis, and (2) manipulation of hydrogen plasmas with catalysts to induce fractional quantum electronic states that yield large energy outputs;

COLD FUSION or non-radioactive low-temperature nuclear reactions by electrochemical means, induced in water and heavy water solutions catalyzed by (1) palladium cathodes, (2) sonocavitation and (3) other processes that can produce large amounts of thermal, radiation-free nuclear energy;

VACUUM ENERGY or zero-point energy, tapping the enormous quantum potential of every point in space-time, through the use of (1) super-motors with super-magnets (cf., the experiments of Michael Faraday in the 1830s), (2) solid state devices, (3) Tesla coils, and (4) charge clusters; and

THERMAL ENERGY from the environment.

Any one of the above approaches to new energy promises a quantum leap, i.e., orders of magnitude increase, in our ability to tap and have abundant clean, cheap, decentralized energy for all of humanity. In addition, there are many important transitional technologies which can mitigate emissions in the very near future, as follows:

RECYLING AND SEQUESTRATION OF CO2 AND OTHER POLLUTANTS AT THE SOURCE through innovative chemistry; and

REMEDIATION OF RADIOACTIVE NUCLEAR WASTE with innovative technologies, based on the principles of low temperature non-radioactive nuclear transmutations.

All of the above concepts have already been demonstrated in laboratories throughout the world (I have seen many such demonstrations) and have been published in the peer-reviewed literature. [14] But implementing them has proven difficult because there is no significant support for the R&D. This lack of support for unconventional thinking is familiar to those who know the history of innovation. That is to say, there is generally a bias against the credibility of a new technology until it is accepted by the mainstream culture. The most strident objectors are often scientists themselves because some of their treasured “laws” appear to be broken by breakthrough experiments that often lead to profound technological change. The bigger the change the bigger still is the resistance, by a large margin.

In spite of these severe limitations, I propose here that the transformation of our energy culture to one based on new energy may be necessary for our survival, and that we should embark on a research and development program as soon as possible. On the other hand, if the world community decides not to develop new energy [2], then we must all look at the implications of Monbiot’s scenario of power-down, conventional renewables and increased conservation. [5] I summarize in Table 2 some specific new energy technologies now being researched, but currently unsupported to any significant degree:

Table 2. New and unconventional approaches to energy generation may include, but are not limited to, energy generation systems based on:

1	Manipulation of electric and/or magnetic fields with novel circuits, materials, or fluids with reciprocating and/or rotating platforms
2	Catalytic activation of electron energy levels in

	hydrogen, noble gas, or molecular gas plasma
3	Zero-point energy conversion and/or Casimir effect nanotechnology engines, Van der Waals force devices, zero-bias diodes and/or non-thermal rectifiers
4	Non-radioactive, aneutronic, or minimally radioactive low-temperature fission or fusion reactors
5	Novel nuclear waste remediation processes
6	Novel chemical carbon sequestration methods at the source

4. THE CHALLENGE

Political discussions about global warming and climate change have matured to the point where we all recognize we have a very big problem, and that we all must cut back on our carbon emissions. But there is not yet any serious attention paid to the solutions. The conventional renewables amount to 7 % of current and projected energy demand through the year 2030. [15] An additional small percentage can be gained by increasing the efficiency of our energy systems such as phasing in hybrid cars, better insulation and passive solar heating of buildings, and power co-generation. More savings can come from cutting down our demand for energy.

While nations such as Iceland (geothermal), Denmark (wind), Ecuador (hydropower), Brazil (ethanol from sugar cane) and desert nations (solar) are fortunate enough to potentially provide a high percentage of their energy from renewables, most of the world is not so lucky. Each renewable source has its limitations either because of high materials and land use, site suitability, intermittency and diffuseness - or a combination of these.

On the other hand, the new energy technologies, now unsupported, give us a chance for a breakthrough towards a global economy in which we could have clean, cheap, decentralized power and fuels. Someone, somewhere in this world will need to acknowledge and support this research and development. Just as importantly, our society may need to adapt to the potential reality of a new energy revolution.

But most importantly, we should change our political and corporate power structures now in control of our energy policies. Gone must be our carving up the Middle East for the "big prize" of oil, immortalized by a neoconservative- and energy-conglomerate-controlled secret energy task force convened in 2001 by U.S. Vice President Dick Cheney. Gone must be the assumption that we can blithely burn fossil fuels and uranium towards our own oblivion. (16) Any nation or individual who really wants to look at the most appealing options should consider a blend of both the traditional and unconventional renewable energy choices, plus placing severe limits on carbon emissions. This option can provide us with answers if we only have the courage to change.

Mother Earth is dying. She is in the Emergency Room with a high fever induced by human neglect, greed and stupidity. Do we have the will to come together in world community and create those social structures that could facilitate the transition to a clean energy future? We can only try. We and all of nature must depend on our taking responsibility to correct our grievous actions.

REFERENCES AND NOTES

1. State of the World, annual report of the Worldwatch Institute, Washington, D.C. and Norton Press, New York and London.
2. O'Leary, Brian, Re-Inheriting the Earth, 2003, www.brianoleary.com or P.O. Box 258, Loja, Ecuador (available in English and Spanish).
3. United Nations Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment, 2007.
4. Al Gore, An Inconvenient Truth, nominated for an Academy Award as Best Documentary of 2006.
5. George Monbiot, Heat, Penguin Books, London, 2006.
6. Because the recent IPCC report represents a conservatively biased consensus of climate scientists, some scientists predict much more accelerated global warming because of the IPCC's underestimate of the rate of melting of the Antarctica and Greenland ice shelves, and nonlinearities such as the accelerating melting of the Siberian permafrost, which is releasing large quantities of methane, twenty times more powerful than carbon dioxide as a greenhouse gas. Also, our oceans and forests are becoming less efficient as absorbers of carbon dioxide. Dr.James Hansen believes global warming might be passing a tipping point towards runaway warming beyond which there will be no return.
7. Many scientists and economists believe we are reaching peak production of oil in this decade, a point beyond which decreasing supplies will raise prices to levels high enough to destroy the world economy. Look under "peak oil" for discussions of this issue.
8. Michael T. Klare, "Is Petro-Fascism in Your Future?", www.TomDispatch.com, Jan. 2007.
9. Leading environmentalist scientist, Dr. James Lovelock has advocated nuclear power as the only safe, potentially pervasive energy

technology that could get us away from carbon emissions, www.ecolo.org/lovelock; “Our Nuclear Lifeline”, Readers Digest, April 2005.

10. John O’M Bockris and T. Nejat Veziroglu, Solar Hydrogen Energy, Optima Press, London, 1991.
11. Richard Heinberg, The Party’s Over, Powerdown, The Oil Depletion Protocol, New Society Publishers, 2005 and 2006.
12. Drs. John Holdren (Harvard) and Nathan Lewis (Caltech), presented to the summer 2006 Aspen Ideas Festival. For a further discussion of why environmentalists find those conventional renewables now available have problems, see Lisa Baker, “Impossible to Please”, Brainstorm NW, Lake Oswego, Oregon, December 2006.
13. Brian O’Leary, Miracle in the Void, Kamapua’a Press, Loja, Ecuador, 1996.
14. The website www.newenergycongress.org lists the top 100 unconventional energy technologies; www.brianoleary.com describes some rationales for supporting new energy R&D. Some of us are now in the process of drafting the Energy Innovation Act of 2007, to be introduced into U.S. Congress, providing for funds for new energy R&D. My recent essay “Call for a New Energy Revolution” is published in Scientific Discovery (Jan. ’07), the newsletter of the World Innovation Foundation, www.thewif.org.uk,
15. Statistics from the U.S. Department of Energy’s Energy Information Administration show that the projected energy mix worldwide will change very little between now and 2030, certainly by not nearly enough to address global warming.

    The U.S. government has defied not only the Kyoto climate accords, it has accused the IPCC report itself as being too pessimistic, in contradiction to the assessments of several reputable climate scientists, including ones who work for the U.S. government such as Dr. James Hansen, Director of the NASA Goddard Institute for Space Studies. Instead, the Bush administration proposed such far-out solutions as injecting particles into the atmosphere (chemtrails?) or deploying orbital mirrors that would reflect sunlight back into space, as measures to compensate for global warming. This “global dimming” would be a very expensive, polluting and dangerous action in itself, because of the uncertainties in the long-term climate change mechanisms. The U.S. Department of Energy is also funding substantial efforts to sequester carbon near coal mines, another grosser-level solution. This intention to “terror-form” the Earth would be messy, expensive and an excuse to keep emitting greenhouse gases. It seems that U.S. energy policies are geared more towards insisting we all rely on resources and technologies that enhance the profits of giant energy and military conglomerates than on searching for ways to develop clean energy and reverse global warming. Not only does the U.S. not support new energy research, but its flagship National Renewable Energy Laboratory (NERL) flounders with a steady annual $200 million budget, equivalent to one day of fighting in Iraq or two days of profits for Exxon Mobil. Environmental scientist John Holdren of Harvard University agrees: “We are not starting to address climate change with the technology we have in hand, and we are not accelerating our investment in energy technology research and development.” The Bush Administration’s refusal to place any limits on carbon emissions and its recent proposal to quintuple the use of ethanol-from-corn to supplement gasoline will probably end up with a policy in which we all emit more carbon than just burning petroleum without the ethanol. Growing biofuels also consumes land that could otherwise be used for agriculture. It would only enrich big agribusiness. We must find ways to reverse these destructive “solutions” that merely aggrandize the military-industrial complex and the maintenance of centralized control of our energy technologies. The Bush administration’s lies about climate scientists’ reports on climate change and its refusal to fund any significant R&D of any renewables means enormous suffering for all of us. These policies must be opposed.