



## Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy

Mark Selden, Arjun Makhijani

Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy

Arjun Makhijani and Mark Selden

*Arjun Makhijani is President of the Institute for Energy and Environmental Research [www.ieer.org/](http://www.ieer.org/), an organization dedicated to increasing public involvement in and control over environmental problems through the democratization of science. A specialist on nuclear weapons and nuclear power, waste and testing, and energy conservation, he holds a Ph.D. in engineering (specialization: nuclear fusion) from the University of California at Berkeley. He is the principal author of the first study ever done (completed in 1971) on energy efficiency potential in the U.S. economy, the principal editor of [Nuclear Wastelands](#), and the principal author of [Mending the Ozone Hole](#). His forthcoming book, *Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy*, is a joint project of the Nuclear Policy Research Institute and the Institute for Energy and Environmental Research.*

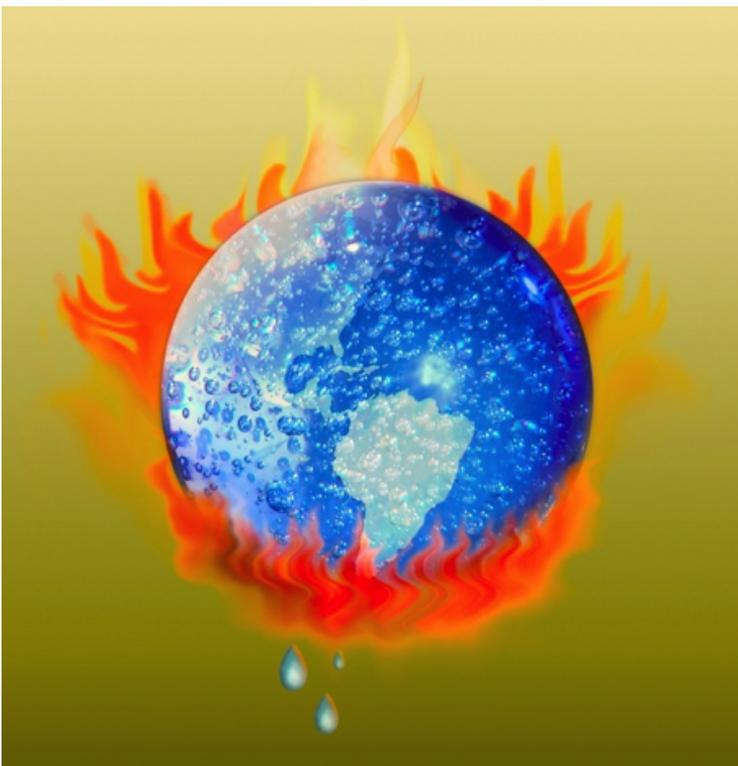


Arjun Makhijani

Mark Selden conducted this Japan Focus interview with Arjun Makhijani on August 10, 2007. Makhijani explains his program for transforming US energy use, sets the issues in international context, and discusses what it will take to halt global warming.

*Why zero carbon emissions? Not even the boldest proposals have called for zero emissions, even defined as you do as a few percentage points of CO2 emissions on either side of zero. We understand the necessity to sharply reduce carbon emissions to safe limits and to reverse the carbon excess in the environment. Still, why zero emissions? Is this simply a means to draw attention to the problem where substantial reductions rather than zero emissions would solve the multiple problems associated with the present profligate fossil fuel and other nonrenewable energy consumption? Does the demand for zero emissions not risk alienating potential support for a feasible program of sharp reductions?*

The United Nations Framework Convention on Climate Change requires the burden of reductions to be borne with present and past inequities taken into account. At the very least, this will mean that any CO2 emissions that are allowed would be allocated on a per person basis.



At the same time, the Intergovernmental Panel on Climate Change has estimated that if temperature rise by mid-century is to be limited to less than 2 to 2.4 degrees Celsius, it will be necessary to reduce global CO2 emissions by 50 to 85 percent. The former number (a 50 percent reduction in emissions) corresponds to a 15 percent chance that the temperature rise will be limited to that range; the latter (an 85 percent reduction in emissions) an 85 percent chance. If the remaining CO2 emissions are allocated on a per person basis, and we assume that we will need a reduction of 50 percent in CO2 emissions, the United States will have to reduce its emissions by 88 percent. At this level, it will still be very likely that we will not be able to meet the temperature rise limit. For that we must reduce global emissions by 85 percent. The U.S. goal, given its world-leading position in CO2 emissions, would then have to be 96 percent. This is operationally the same as zero-CO2 emissions. (I assume a global population of 9 billion and a U.S. population of 420 million in the year 2050).



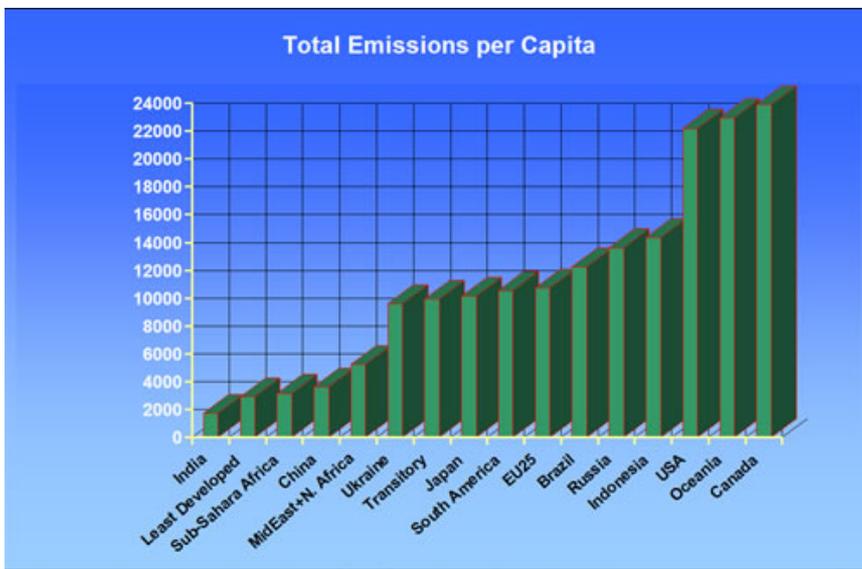
The other reason to actually go to 100 percent elimination is that climate change is shaping up to be more severe than estimated by models. We may have to remove CO2 from the atmosphere that has already been emitted to try to mitigate the severity. It makes no sense to remove CO2 at great expense while emitting more. So I studied the technical feasibility of achieving an energy economy actually eliminating all fossil fuels. Some coal and natural gas infrastructure would be maintained as a contingency, but not used unless there is a major technical failure. Even then coal would only be used with carbon sequestration.

Finally, the solution to other problems, notably oil-related insecurities accompanies a zero-CO2 economy. It is not necessary to have a zero-CO2 economy in the United States to accomplish a reduction of oil-related insecurities. There are a variety of ways to do that, such as turning coal to liquid fuels. But such choices would aggravate CO2 emissions.

*You focus on the U.S. Could you locate the U.S. within the global framework of energy consumption, showing the critical dimensions of U.S. reduction of carbon emissions to the overall future of humanity? In particular, could you locate the U.S. problem within the framework of the Asia Pacific region?*

I focus on the U.S. because it is the largest emitter of CO2. But obviously it makes no sense for the U.S. to eliminate all its CO2 emissions, while others are doing business as usual and continuing fossil fuel use.

A U.S. direction of significantly reducing petroleum consumption would have a major positive effect on global politics, including in the Asia Pacific region. Much geopolitical competition, including between China and Japan, is over oil. This is exemplified in their dispute over rights to oil resources in the Sea of Japan, in competing plans for the location of Russia's oil pipeline, and in territorial conflicts over the Spratly Islands involving several Asian countries. Some U.S.-Chinese tensions are also related to oil, including their competition in Africa and their differing stance toward Iran. If there is less reason for Japan and China to compete over petroleum, the drift towards a more active military posture by Japan may also be halted.



I am not saying that a gradual U.S. withdrawal from the oil market would solve most or all major geopolitical problems, but it could contribute to a different setting in which other problems are addressed. New problems may also emerge. For instance, oil exporting countries may want to be compensated for not producing oil.

Finally, a U.S. goal of zero-CO2 emissions would bring China and India to the table of climate change discussions in more positive ways, which would benefit the whole Asian Pacific region and the world.

*A vigorous carbon emissions reduction program on even a fraction of the scale your report envisages would enable the U.S. to lead the international drive to overcome global warming, reversing its present position as a laggard in this arena. I understand the necessity to issue a wakeup call to the U.S. Nevertheless, what considerations led you to focus exclusively on the U.S. rather than locating the problem in interactive terms involving other nations and international organizations?*

I think that without US action, there can be no US leadership, and without such leadership, global efforts to curb emissions will be gravely weakened. At this stage, preaching temperance from the barstool is not an option for the U.S., if it ever was. As I have already explained, a zero-CO2 emissions goal is not only desirable for protecting the environment, it is also implied by U.S. treaty commitments. It will be impossible to bring China and India and Brazil and other developing countries to the table for really serious reductions in CO2 emissions, unless the US abides by the spirit of the United Nations Framework Convention on Climate Change. And that needs to happen soon. I believe that is why former Vice-President Gore has called on the developed countries to reduce their greenhouse gas emissions by 90 percent by 2050.[1] It will be interesting to see how President Bush's climate change summit at the end of September develops, and what India and China will have to say.

*One notable omission from your recommendations concerns the vast global oil and energy uses of the Pentagon, by far the largest U.S. energy consumer. The question of the Pentagon of course draws attention to the link between energy consumption and the geopolitics that define the US global posture. Please comment on the reasons for the omission, and suggest how you would approach this important element in any emissions reduction program.*

The Pentagon's oil consumption is quite high. Direct Pentagon oil demand was about 320,000 barrels of oil a day in 2006.[2] But this is mainly a reflection of the Pentagon budget, which is now about \$650 billion per year. This amounts to about 5 percent of the U.S. Gross Domestic Product. The U.S. consumes about 20 million barrels of oil a day; five percent of that is 1 million barrels a day. So, while 320,000 barrels a day looks large, it is a smaller proportion of oil than the Pentagon budget is of U.S. GDP. Actually, it does not include all Pentagon oil consumption because it takes no account of the oil used by Pentagon contractors and the companies that build U.S. military equipment.

The underlying problem is not really high oil consumption, though there are probably inefficiencies in the Pentagon as in most other sectors of the economy. The real issue is high military spending. Oil consumption is a reflection of that. The issue of military spending is important, but it is not within the scope of the zero-CO2 emissions book that I have just finished.

*There are technical imperatives, but there are also political imperatives if the ravages of global warming are to be mitigated. How can we frame a series of proposals that will be taken seriously by political actors? Recently, Australian environmentalist Clive Hamilton critiqued George Monbiot's call for Britain to reduce carbon emissions by 90 percent by 2030 as politically unrealizable, however praiseworthy. In the US, a nation with no serious debate about a feasible emissions reduction program, is your call merely a wakeup call drawing attention to the disasters that await us? Under what circumstances could it become a rallying cry for political forces in the US and internationally? All the more so with neoliberal thinking so powerfully in the ascendant, what would be required to contemplate the unthinkable proposal you have formulated?*

My proposal should be distinguished from Monbiot's call for a 90 percent reduction by 2030. That seems much too short a time for the immense investment and infrastructural changes that will be needed for a 90 percent CO2 reduction. I think it will take about 40 years to do the job. If there are several new technological breakthroughs in the next decade, it could possibly be done by about 2040. Even then, I recognize that the political hurdles are immense. There is a huge lobby for fossil fuels; solar energy and efficiency are puny by comparison.

Even though President Bush has promised to "consider seriously decisions made by the European Union" which imply global reductions in CO2 of 50 to 85 percent,[3] were he confronted with a bill that required corresponding U.S. action (88 to 96 percent reductions by 2050), he would be likely to veto it.

The most leverage, politically and economically, is at the state and city level and with the corporations that stand to lose a lot through inaction. Cities are where much of the action needs to take place anyway. They can require the conversion of their taxis to hybrids and purchase plug-in hybrids. They can follow the lead of New York City in encouraging bicycling and car-free greenways and promoting public transportation or London in restricting traffic to and from the core of the city.[5] They can lobby Congress for grants for renewable energy infrastructure. They can grow energy crops in their wastewater systems.

There are also corporations, for instance, like insurance companies, like Swiss Re, and chemical companies, like DuPont, that see the handwriting of climate change on the wall. They also want a piece of the action in research and the production of environmentally sound products. Some of them have accepted a goal of 60 to 80 percent reduction in U.S. greenhouse gas emissions.

California is in fact a leader in energy policy today. Governor Schwarzenegger aspires to be a global leader on climate change. In his State of the State address last January he said:

Not only can we lead California into the future ... we can show the nation and the world how to get there. ...We are the modern equivalent of the ancient city-states of Athens and Sparta. California has the ideas of Athens and the power of Sparta.

...

I propose that California be the first in the world to develop a low carbon fuel standard that leads us away from fossil fuels...Let us blaze the way, for the U.S. and for China and for the rest of the world.

...

California has the muscle to bring about such change. I say use it.[6]

He will go to the United Nations in September and talk about climate change. The Secretary General of the UN has made it a top priority.[7]

There is a parallel to the phaseout of CFCs, which deplete the ozone layer. In the late 1980s and early 1990s, there were so many different local and state regulations on reducing CFC emissions, that large corporations began to lobby seriously for national regulations. Something similar needs to happen with setting an ambitious goal for eliminating CO2 emissions, and there are many signs that it is already happening. Basically, Washington will be forced to act by changes throughout the country. It is important to make it an issue in the next elections at all levels from the local to the presidential.

I did the study to show that it is technically and economically feasible to eliminate fossil fuels and nuclear power from the U.S. economy. That is a pre-condition for pushing to get it done. Of course, it does not guarantee that it will get done. It will take a lot of hard work and several years to build the political muscle for a zero-CO2 emissions goal to be adopted. But I think it can be done.

## Notes

[1] Gore 2007.

[2] Karbuz 2007.

[3] G-8 Summit 2007. The declaration states that the United States will "consider seriously the decisions made by the European Union, Canada and Japan which include at least a halving of global emissions by 2050." (paragraph 49. In fact the EU goal is to limit the temperature rise to 2 to 2.4 degrees Celsius. This implies a 50% to 85 percent reduction in CO2 emissions. See IPCC 2007 and European Parliament 2007, p. 1.

[4] See New York City Department of City Planning [here](#).

[5] Changing modes of transport are not included in the reference scenario. However, certain changes help in reducing energy use and pollution. See Chapters 4 and 6.

[6] Governor Arnold Schwarzenegger, [State of the State speech](#), January 9, 2007.

[7] Chea 2007.

**Read the executive summary of Arjun Makhijani's forthcoming book [here](#).**

*The complete book, Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy, by Arjun Makhijani, is available [here](#).*

*Mark Selden is a research associate in the East Asia Program at Cornell University and a Japan Focus coordinator.*

*This interview was prepared for Japan Focus and posted on August 11, 2007.*