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### SUSTAINABLE ENERGY STUDY #15

Landmark Energy Policy Study Points the Way to U.S. Energy Future without Fossil Fuels or Nuclear Power - Protecting Climate Will Require Essentially Complete Elimination of U.S. Carbon Dioxide Emissions by 2050:

Institute for Energy and Environmental Research, July 30, 2007

<http://www.ieer.org/carbonfree/pressrelease.html>

At the G-8 summit in Germany in June 2007, President Bush promised to "consider seriously" the European Union goal of cutting greenhouse gas emissions sufficiently to limit global temperature rise to about 4 degrees Fahrenheit. A new study concludes that the United States could eliminate almost all of its carbon dioxide emissions by the year 2050. It also concludes that it is possible to do so without the use of nuclear power. The landmark study, Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy, was produced as a joint project of the Nuclear Policy Research Institute and the Institute for Energy and Environmental Research.

"A technological revolution has been brewing in the last few years, so it won't cost an arm and a leg to eliminate both CO<sub>2</sub> emissions and nuclear power," said Dr. Arjun Makhijani, author of the study and president of the Institute for Energy and Environmental Research. "We can solve the problems of oil imports, nuclear proliferation as it is linked to nuclear power, and carbon dioxide emissions simultaneously if we are bold enough."

The "Roadmap" concludes that the United States can achieve a zero-CO<sub>2</sub> economy without increasing the fraction of Gross Domestic Product devoted to lighting, heating, cooling, transportation, and all the other things for which we use energy. The fraction was about 8 percent in 2005. Net U.S. oil imports can be eliminated in about twenty-five years or less, the study estimated.

"The climate crisis has put the earth in the intensive care unit," said Dr. Helen Caldicott, President of NPRI and a physician who has long advocated elimination of nuclear weapons and nuclear power. "We must respond to this acute clinical crisis and act today to save the planet, without resorting to nuclear power, which will aggravate our problems. Dr. Makhijani's report is essential reading for all who care about our future."

The Intergovernmental Panel on Climate Change has estimated that a global reduction of 50 to 85 percent in CO<sub>2</sub> emissions is needed to limit the temperature rise to less than about 4 degrees Fahrenheit. If emissions are allocated equitably, in view of the greater historical and present emissions of the United States and other Western countries, the Roadmap estimates that the

United States will have to eliminate 88 to 96 percent of its CO2 emissions. The United Nations Framework Convention on Climate Change, a treaty that the United States has ratified, places a greater responsibility on developed countries to reduce their emissions in view of historical and present inequities.

According to the Roadmap, North Dakota, Texas, Kansas, South Dakota, Montana, and Nebraska each have wind energy potential greater than the electricity produced by all 103 U.S. commercial nuclear power plants. Solar energy is even more abundant - solar cells installed on rooftops and over parking lots can provide most of the U.S. electricity supply. Recent advances in lithium-ion batteries are likely to make plug-in hybrid cars economical in the next few years.

"Plug-in hybrids should become the standard-issue car for governments and corporations in the next five years. That demand will make prices come down to the point that it can become the standard car design in the next decade," said S. David Freeman, President, Los Angeles Board of Harbor Commissioners and former chairman of the Tennessee Valley Authority. "The health benefits of eliminating fossil fuels and greatly reducing urban air pollution will be immense. Dr. Makhijani's study also shines a light on how we can liberate our foreign policy from oil imports."

Mr. Freeman was the Director of the Energy Policy Project of the Ford Foundation at the time of the Arab oil embargo in 1973. That project's report (A Time to Choose: America's Energy Future), which he, Dr. Makhijani, and others co-authored, became the foundation of U.S. energy policy in the mid- to late-1970s.

"What is really innovative about this Roadmap is that it combines technologies to show how to create a reliable electricity and energy system entirely from renewable sources of energy," said Dr. Hisham Zerriffi, Ivan Head South/North Chair at the University of British Columbia and an expert on distributed electricity grids. "The United States must take action now in order to lead and this Roadmap lays out specific steps that it should take. The study is also remarkable in that it provides backup plans and recommends redundancies that are important for avoiding major missteps on the road to an economy without zero-CO2 emissions."

The study recommends an elimination of subsidies for nuclear power and fossil fuels, and also for biofuels like ethanol when they are made from food crops.

"Ethanol from corn is inefficient and, at best, has only a marginal effect on reducing greenhouse gas emissions" said Dr. Makhijani. "Even at current production levels it is causing inflation in food prices in the United States and hardship for the poor in Mexico and other countries. Biofuels can be made much more efficiently, for instance from microalgae, on land not useful for food."

The study recommends a "hard cap" on CO2 emissions by large fossil fuel users (more than 100 billion Btu per year). The cap would be reduced each year until it reaches zero in 30 to 50 years. There would be no free emissions allowances, no international trade of allowances, and no offsets that would allow corporations to emit CO2 by investing in outside projects to reduce emissions. The emissions of smaller users would be reduced by efficiency standards for appliances, cars, homes, and commercial buildings.

Copies of the 23-page executive summary of the report are available at [www.ieer.org/carbonfree](http://www.ieer.org/carbonfree). The full study will be available for download in August 2007. It will be published as a book by RDR Books in the fall of 2007.

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

### Recommendations: The Clean Dozen

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

[www.ieer.org/carbonfree](http://www.ieer.org/carbonfree)

The 12 most critical policies that need to be enacted as urgently as possible for achieving a zero-CO2 economy without nuclear power are as follows.

- 1) Enact a physical limit of CO2 emissions for all large users of fossil fuels (a "hard cap") that steadily declines to zero prior to 2060, with the time schedule for tightening assessed periodically according to climate, technological, and economic developments. The cap should be set at the level of some year prior to 2007, so that early implementers of CO2 reductions benefit from the setting of the cap. Emission allowances would be sold by the U.S. government for use in the United States only. There would be no free allowances, no offsets and no international sale or purchase of CO2 allowances. The estimated revenues - approximately \$30 to \$50 billion per year - would be used for demonstration plants, research and development, and worker and community transition.
- 2) Eliminate all subsidies and tax breaks for fossil fuels and nuclear power (including guarantees for nuclear waste disposal from new power plants, loan guarantees, and subsidized insurance).
- 3) Eliminate subsidies for biofuels from food crops.
- 4) Build demonstration plants for key supply technologies, including central station solar thermal with heat storage, large- and intermediate-scale solar photovoltaics, and CO2 capture in microalgae for liquid fuel production.
- 5) Leverage federal, state and local purchasing power to create markets for critical advanced technologies, including plug-in hybrids.
- 6) Ban new coal-fired power plants that do not have carbon storage.
- 7) Enact at the federal level high efficiency standards for appliances.
- 8) Enact stringent building efficiency standards at the state and local levels, with federal incentives to adopt them.

9) Enact stringent efficiency standards for vehicles and make plug-in hybrids the standard U.S. government vehicle by 2015.

10) Put in place federal contracting procedures to reward early adopters of CO<sub>2</sub> reductions.

11) Adopt vigorous research, development, and pilot plant construction programs for technologies that could accelerate the elimination of CO<sub>2</sub>, such as direct solar hydrogen production, hot rock geothermal power, and integrated gasification combined cycle plants using biomass with a capacity to sequester the CO<sub>2</sub>.

12) Establish a standing committee on Energy and Climate under the U.S. Environmental Protection Agency's Science Advisory Board.

### Summary of Main Findings

From Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy  
[www.ieer.org/carbonfree](http://www.ieer.org/carbonfree)

1. A goal of a zero-CO<sub>2</sub> economy is necessary to minimize harm related to climate change.
2. The use of nuclear power entails risks of nuclear proliferation, terrorism, and serious accidents. It exacerbates the problem of nuclear waste and perpetuates vulnerabilities and insecurities in the energy system that are avoidable.
3. A hard cap on CO<sub>2</sub> emissions - that is, a fixed emissions limit that declines year by year until it reaches zero - would provide large users of fossil fuels with a flexible way to phase out CO<sub>2</sub> emissions. However, free allowances, offsets that permit emissions by third party reductions, or international trading of allowances, notably with developing countries that have no CO<sub>2</sub> cap, would undermine and defeat the purpose of the system. A measurement-based physical limit, with appropriate enforcement, should be put into place.
4. A reliable U.S. electricity sector with zero-CO<sub>2</sub> emissions can be achieved without the use of nuclear power or fossil fuels.
5. The use of highly efficient energy technologies and building design, generally available today, can greatly ease the transition to a zero-CO<sub>2</sub> economy and reduce its cost. A two percent annual increase in efficiency per unit of Gross Domestic Product relative to recent trends would result in a one percent decline in energy use per year, while providing three percent GDP annual growth. This is well within the capacity of available technological performance.
6. Biofuels, broadly defined, could be crucial to the transition to a zero-CO<sub>2</sub> economy without serious environmental side effects or, alternatively, they could produce considerable collateral damage or even be very harmful to the environment and increase greenhouse gas emissions. The outcome will depend essentially on policy choices, incentives, and research and development, both public and private.

7. Much of the reduction in CO<sub>2</sub> emissions can be achieved without incurring any cost penalties (as, for instance, with efficient lighting and refrigerators). The cost of eliminating the rest of CO<sub>2</sub> emissions due to fossil fuel use is likely to be in the range of \$10 to \$30 per metric ton of CO<sub>2</sub>.

8. The transition to a zero-CO<sub>2</sub> system can be made in a manner compatible with local economic development in areas that now produce fossil fuels.