

# SUN DAY CAMPAIGN

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## SUSTAINABLE ENERGY STUDY #9

Renewable Energy and Energy Efficiency Can Turn the Tide on Global Warming:

Many scientists have now agreed upon the minimum target for reducing greenhouse gas emissions necessary to preserve a habitable planet. The target is to keep the global average temperature from rising by more than one degree Celsius, and to do so it will be necessary to limit atmospheric CO2 levels to 450 to 500 ppm. That means reducing U.S. emissions by 60 percent to 80 percent by mid-century.

In response, the American Solar Energy Association (ASES) makes this extraordinary claim: "Energy efficiency and renewable energy technologies have the potential to provide most, if not all, of the US carbon emissions reductions that will be needed to help limit the atmospheric concentration of carbon dioxide to 450 to 500 ppm."

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Tackling Climate Change in the U.S. - Potential Carbon Emissions Reductions from Energy Efficiency and Renewable Energy by 2030:

On January 31, 2007, ASES unveiled a 200-page report, "Tackling Climate Change in the U.S.: Potential Carbon Emissions Reductions from Energy Efficiency and Renewable Energy by 2030."

The result of more than a year of study, the report, edited by Chuck Kutscher, illustrates how energy efficiency and renewable energy technologies can provide the emissions reductions required to address global warming.

The ASES report takes a unique approach. Instead of turning to the systems analysts who normally tackle such problems, ASES recruited a volunteer team of top energy experts. These experts produced a series of nine papers that examined how energy efficiency and renewable energy technologies can reduce U.S. carbon dioxide emissions—the main cause of global warming.

ASES asked the experts in each technology to estimate how much carbon-emitting energy their technologies could displace. Each technology is conceived of as a "wedge" in a stack of wedges that add up to a replacement for fossil fuels. The report consists of separate papers on each technology, including energy efficiency in buildings, transportation, and industry, as well as six renewable energy technologies: concentrating solar power, photovoltaics, wind power, biomass, biofuels, and geothermal power.

Each paper was written by experts in the technology - presumably giving the most realistic possible assessment of the capabilities of the technology. And each technology was evaluated in terms of its current capabilities without relying on any major new technical breakthroughs, although some research and development to increase efficiency and reduce costs was assumed.

The papers took economic factors into account and real world constraints like the silicon supply shortage that has hampered photovoltaic productions. While the report does not estimate a total cost for the deployment of the technologies, it does assume that some government support for R&D and production tax credits will be available.

ASES subsequently collected the nine papers together and added an overview of the studies to create the report.

Despite its conservative assumptions, the ASES report concludes these technologies can displace approximately 1.2 billion tons of carbon emissions annually by the year 2030—the magnitude of reduction that scientists believe is necessary to prevent the most dangerous consequences of climate change. That is, renewables and efficiency alone can meet the goal of a 60 to 80 percent emissions reduction by mid-century while the economy continues to grow. Energy efficiency accounts for 57 percent of the reductions, and the renewable energy technologies provide the other 43 percent.

The report illustrates how energy efficiency measures could keep U.S. carbon emissions roughly constant over the next 23 years as the economy grows, and how renewable energy technologies could make deep cuts below today's emissions. Wind energy provides about 35% of the renewable energy contribution, while the rest is divided about evenly among the other technologies. "Energy efficiency and renewable energy technologies can begin to be deployed on a large scale today to help save us from the worst consequences of global warming," said Kutscher. "With continued R&D to lower costs and a reasonable level of policy support, they have the potential to meet most, if not all, of the carbon reductions that will be required in the future."

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Excerpts from the Executive Summary:

Estimates are that industrialized nations must reduce emissions about 60 percent to 80 percent below today's values by mid-century. Accounting for expected economic growth and associated increases in carbon emissions in a business-as-usual case, in 2030 the U.S. must displace between 1,100 and 1,300 million metric tons of carbon per year (MtC/yr).

ASES looked at energy efficiency and renewable energy technologies to determine the potential carbon reduction for each. The authors of the renewable technology papers were asked to describe the resource, discuss current and expected future costs, and develop supply and carbon-reduction curves for the years 2015 and 2030.

The potential carbon reductions (in MtC/yr in 2030) based on the middle of the range of carbon conversions are as follows:

688 - Energy Efficiency \*  
63 - Concentrating Solar Power  
63 - Photovoltaics  
181- Wind  
58 - Biofuels  
75 - Biomass  
83 - Geothermal

\* Energy efficiency contributions in the buildings, transportation, and industry sectors are combined into one number.

Approximately 57 percent of the total carbon-reduction contribution is from energy efficiency and about 43 percent is from renewables. Energy efficiency measures can allow U.S. carbon emissions to remain about level through 2030, whereas the renewable supply technologies can provide large reductions in carbon emissions below current values.

The total of the carbon-reduction potentials for the year 2030 is between 1,000 and 1,400 MtC/yr, or an average of about 1,200 MtC/yr based on a mid-range value for electricity-to-carbon conversion. This would put the U.S. on target to achieve the necessary carbon-emissions reductions by mid-century.

A national commitment that includes effective policy measures and continued research and development will be needed to realize these potentials. Integration of these technologies in the marketplace could reduce these potentials somewhat due to competition and overlap in some U.S. regions. On the other hand, even greater wind and solar contributions might be possible through greater use of storage and high-efficiency transmission lines.

The studies focused on the use of renewable energy in the electricity and transportation sectors, as these together are responsible for nearly three-quarters of U.S. carbon emissions from fossil fuels. Goals for renewables are often stated in terms of a percentage of national energy. The results of these studies show that renewable energy has the potential to provide approximately 40 percent of the U.S. electric energy need projected for 2030 by the Energy Information Administration (EIA). After reducing the EIA electricity projection by taking advantage of energy efficiency measures, renewables could provide about 50 percent of the remaining 2030 electric need.

There are uncertainties associated with the values estimated in the papers, and, because these were primarily individual technology studies, there is uncertainty associated with combining them. The results strongly suggest, however, that energy efficiency and renewable energy technologies have the potential to provide most, if not all, of the U.S. carbon emissions reductions that will be needed to help limit the atmospheric concentration of carbon dioxide to 450 to 500 ppm.

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The complete report is available as a free download at [www.ases.org/climatechange](http://www.ases.org/climatechange). High-quality graphics showing the various emissions reductions and deployment locations are also available at that site.

A good article "Renewables Can Turn the Tide on Global Warming" by Kelpie Wilson, provides an overview of the report; it appears in the February 12, 2007 issue of TruthOut.org and can be found at: <http://www.alternet.org/envirohealth/47654>