

## Sustainable Developments

# Keys to Climate Protection

Dramatic, immediate commitment to nurturing new technologies is essential to averting disastrous global warming

BY JEFFREY D. SACHS



**Technology policy lies at the core of the climate change challenge.** Even with a cutback in wasteful energy spending, our current technologies cannot support both a decline in carbon dioxide emissions and an expanding global economy. If we try to restrain emissions without a fundamentally new set of technologies, we will end up stifling economic growth, including the development prospects for billions of people.

Economists often talk as though putting a price on carbon emissions—through tradable permits or a carbon tax—will be enough to deliver the needed reductions in those emissions. This is not true. Europe's carbon-trading system has not shown much capacity to generate large-scale research nor to develop, demonstrate and deploy breakthrough technologies. A trading system might marginally influence the choices between coal and gas plants or provoke a bit more adoption of solar and wind power, but it will not lead to the necessary fundamental overhaul of energy systems.

For that, we will need much more than a price on carbon. Consider three potentially transformative low-emissions technologies: carbon capture and sequestration (CCS), plug-in hybrid automobiles and concentrated solar-thermal electricity generation. Each will require a combination of factors to succeed: more applied scientific research, important regulatory changes, appropriate infrastructure, public acceptance and early high-cost investments. A failure on one or more of these points could kill the technologies.

CCS, for example, depends on the ability to capture carbon dioxide at the power plant at low cost, transport it by pipeline over significant distances, and sequester it underground safely, reliably and durably. All these components are close to deployment, but each faces major challenges. Carbon capture is most promising for new types of coal-fired plants whose cost and reliability are yet to be proved. A vast new network of carbon dioxide pipelines would require major regulatory and policy support, with environmental and property-rights hurdles. The geologic sequestration of carbon dioxide at large scales must also be proved, carefully monitored and environmentally regulated. Early demonstration projects are likely to be many times more costly than later ones. Broad public acceptance and support will be crucial for the technology. Yet to date, the U.S. government has failed to get even one demonstration CCS power plant off the ground, and various private initiatives are currently strand-

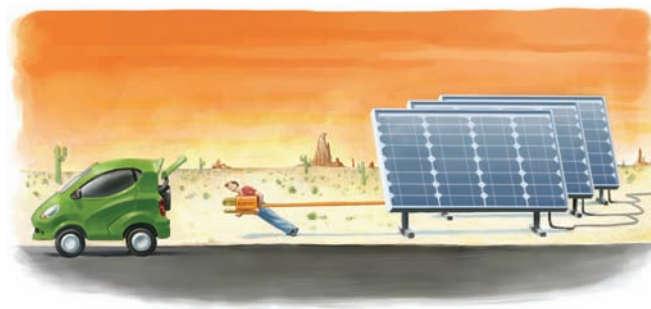
ed, all because of the lack of public support and financing.

Plug-in hybrid automobiles pose similar puzzles. Basic questions remain about the safety, reliability and durability of the batteries they require, as well as the need for extra investments in the power grid to support them. Solar-thermal power, which uses concentrated solar radiation in desert locations to boil water for the steam-turbine generation of electricity, also depends on solving a host of problems. Scientific challenges include the nighttime storage of power, and regulatory and financial obstacles include the installation of a new high-voltage, direct-current transmission grid to carry power over long distances from the desert to other locations.

The issues become even more complex when we consider that low-emissions technologies developed in the rich world will need to be adopted rapidly in poorer countries. Patent protection, while promoting innovation, could slow the diffusion of these technologies to low-income countries unless compensatory actions are taken.

All this technological innovation needs to start soon if we are to have a chance to stabilize carbon emissions at levels that avoid huge and potentially devastating global costs. By 2010 at the latest, the world should be breaking ground on demonstration CCS coal-fired plants in China, India, Europe and the U.S.; the wealthy nations should be helping to finance and build concentrated solar-thermal plants in states that border the Sahara; and highly subsidized plug-in hybrids should be rolling off the assembly line. Only these steps will enable us to peer much farther down the path of truly transformative change. ■

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