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THE ENERGY CHALLENGE

Energy Research on a Shoestring

By [CLIFFORD KRAUSS](#)

GOLDEN, Colo. — Thirty years after it was founded by President [Jimmy Carter](#), the National Renewable Energy Laboratory at the edge of the Rockies here still does not have a cafeteria.

Evaporation chambers for new solar energy systems look like they belong in an H. G. Wells movie. Technicians had to knock out a giant door from a testing facility to fit modern wind turbine blades, which now stick out like a bare toe from an old sock.

The hopes for this neglected lab brightened a bit just over a year ago when President Bush made the first presidential call on the lab since Mr. Carter and spelled out a vision for the not-too-distant future in which solar and wind power would help run every American home and cars would operate on biofuels made from residues of plants.

But one year after the president's visit, the money flowing into the nation's primary laboratory for developing renewable fuels is actually less than it was at the beginning of the Bush administration. The lab's fitful history reflects a basic truth: Americans may have a growing love affair with renewables and the idea of cutting oil imports and conserving energy, but it is a fickle one.

Riding that wave, the new House speaker, [Nancy Pelosi](#), just promised committee hearings on how lawmakers could help limit [climate change](#) and enhance energy independence; Congressional Democrats pledged to find more research dollars for clean energy. [And President Bush, in his State of the Union address, called for greater federal mandates to increase use of homegrown alternative fuels.]

But the intertwined goals of developing domestic energy resources and reducing global warming gases are not necessarily in step with each other. Despite a lot of promises, no one so far has wanted to pay the extra costs to make wind and solar more than a trivial energy source. Research is uncertain and expensive, and the benefits seem far away.

So while all kinds of domestic energy technologies are being advanced in the name of energy independence, most of the money and attention are still focused on the dirty but cheaper standbys: offshore oil, oil sands and coal, in all its various incarnations, from straight out of the pit to black-coal liquid.

"You have fossil fuels competing with renewable fuels," said Benjamin Kroposki, a senior scientist at the Renewable Energy Laboratory. "Renewables lose every time."

One example is the shotgun approach to tax incentives, loan guarantees and other spending in the 2005 energy act, the first major energy legislation enacted by Congress in a decade: \$13.1 billion for oil, gas and

coal, \$12 billion for nuclear energy and \$7.7 billion divided up among a wide assortment of renewables like ethanol, hydroelectric, wind and solar.

Now that they are in control of Congress, Democrats have promised to increase the amount going to renewable energy sources, taking the money from tax breaks for oil companies.

But even additional money for renewable energy will be going up against government tax policies that encourage more energy consumption. Companies can still deduct purchases of sport utility vehicles and utility bills, for example, while consumers get a break to build bigger homes with deductions for interest payments on mortgages, even on second homes, that far outweigh their energy saving credits.

Meanwhile, fuel efficiency standards for automobiles have changed only slightly over the decades, and the federal government still does not have a building code to encourage energy efficiency.

It is a policy mix that goes back many administrations and appears difficult to shake, partly because dirty sources of energy like coal and shale are what the United States has in abundance.

“We are going dirtier,” said Amy Jaffe, an energy expert at the [James A. Baker](#) Institute for Public Policy at [Rice University](#). “If you need to come up with a fuel source other than drilling for oil under the ground in the Middle East, what is the most obvious thing with today’s economy, today’s infrastructure and today’s technology? Oil shale, liquefied coal and tar sands. It’s all dirty but it’s fast.”

Renewable energy today supplies only 6 percent of the country’s energy needs, and much of that comes from decades-old dams supplying hydropower. Under current policies, the Energy Information Administration estimates, renewables will increase only slightly in importance in the decades ahead. They would supply 7 percent of United States energy supplies by 2030, while coal would increase over the same period from 23 percent to 26 percent.

“Denmark gets 22 percent of its electrical energy from wind today and we get 0.5 percent,” noted Robert Thresher, director of the lab’s National Wind Technology Center. “That shows you what you can do when you really want to.”

Meanwhile imports of oil and gas are set to continue to rise in the decades ahead, as domestic production slows and the population grows.

“The current trends do not seem sustainable,” said Faith Birol, chief economist of the International Energy Agency. “For me the most important thing that is missing from current consideration is an increase in vehicle fuel efficiency.”

As they have in the past, higher prices for oil and gas have driven the renewed interest in alternative energy sources. With prices falling, some of that momentum may falter.

Still, President Bush advanced his call last year to end the nation’s oil addiction, providing some of the strongest rhetoric since President Carter called energy independence the moral equivalent of war.

[Mr. Bush set a goal of reducing gas use by 20 percent in the next 10 years. “To reach this goal, we must

increase the supply of alternative fuels, by setting a mandatory fuels standard to require 35 billion gallons of renewable and alternative fuels in 2017; this is nearly five times the current target,” he said Tuesday night.

[On Wednesday the administration sought to put some teeth into the goal by proposing \$1.6 billion in new financing for renewable energy, with a focus on research and production of “cellulosic” energy from nonfood crops and agricultural waste.]

The Democratic Congress appears ready to put clean energy front and center in its agenda.

Prominent Democrats are talking about doubling the budget of the renewable energy lab, and otherwise greatly increase the priority of producing clean energy.

“You’ve got to invest in this new energy future that everybody pays lip service to, but when push comes to shove do we really stand there?” said Representative Mark Udall of Colorado, a senior Democratic spokesman on energy issues. “This is the country’s economic future not to mention the national security ramifications.”

Institutional investments in private clean energy companies in North America and Europe are rising quickly, from \$500 million in 2004 to \$1.3 billion in 2005 to \$2.7 billion in 2006, according to Venture Business Research, an independent group based in Britain.

But even while top energy companies are also beginning to invest significant amounts in wind, solar and plants, those investments pale in comparison with the resources they are pouring into making synthetic fuels out of oil sands, a process that emits significantly more carbon dioxide than conventional oil.

Likewise energy companies are stepping up research and investments into oil sands, deep-ocean oil and gas drilling, and gasifying and liquefying coal — all with significant environmental consequences.

For instance, [Royal Dutch Shell](#) has invested \$1 billion over the last five years in clean energy like biofuels for transportation, solar and wind for electrical generation and hydrogen. That is one of the biggest commitments to clean energy by any company, but it is less than one fifth of what Shell invested over roughly the same period with [Chevron](#) and another partner in a giant oil sand mining project in Canada.

The companies say they can contain emissions through a process called carbon capture and sequestration. But most experts say development of technologies to bury significant amounts of carbon gases effectively could take decades.

At the lab here, signs of change are mixed. Last year, the institution opened its first building in a decade, although meager budgets could leave its main laboratory as much as 80 percent vacant of equipment for the next several years unless Congress suddenly comes to the rescue.

Congressional earmarks that redirected Energy Department financing last year slowed or even shelved many research projects, including ones to develop bigger and more efficient wind turbines, to make hydrogen power out of a mix of algae and water, and to plant matter.

Its scientists are also doing ground-breaking work on finding environmentally benign ways of generating

electricity to produce hydrogen from water to power cars; they are working on new materials and designs to make devices powered by solar cells cheaper; and they are developing enzymes and more efficient machinery to convert switchgrass and corn stalks into biofuels to reduce oil consumption.

When Chevron decided last year that it wanted to develop the next generation of ethanol and renewable plant-based diesel fuels from trees and agricultural waste, it turned to the lab here for a scientific partnership. Now Chevron and scientists from the federal laboratory are working to make hydrogen energy out of decomposed plants. [DuPont](#), Cargill and the National Corn Growers Association look to the lab for help in producing ethanol.

But it is hardly the kind of crash program that government labs have conducted in the past to build an atomic bomb or go to the moon. Rather, the lab gingerly hands over slices of its yearly budget of \$200 million to a smorgasbord of programs in solar, wind, plant matter, geothermal, hydrogen and fuel cells, efficient buildings, advanced vehicles and fuels and electric infrastructure.

“Our budget is nothing compared to the price of a B2 bomber or an aircraft carrier,” Rob Farrington, manager of the lab’s advanced vehicle systems group, said.

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