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Doing More While Using Less Power

By ERICA GIES

SAN FRANCISCO — Energy efficiency is a way to meet the world's growing energy needs, just like building more power plants — except that it costs less, emits no carbon dioxide or radiation, and does not rely on scarce resources in potentially hostile places.

Efficiency is often confused, detrimentally, with conservation. Conservation connotes making do with less — turning down the heat or driving a smaller car. Efficiency means getting more bang per buck. For example, California's 35 years of efficiency standards for appliances have created refrigerators that use 75 percent less electricity than models from the 1970s. Yet today's refrigerators are larger, have more features and cost less in inflation-adjusted dollars.

In transportation, "we could double fuel economy for light-duty vehicles by 2035 without changing the size or acceleration of vehicles," said Lester B. Lave, an economics and engineering professor at Carnegie Mellon University in Pittsburgh and the chairman of a 2010 report on efficiency potential from the National Academy of Sciences.

He said buildings could use nearly 60 percent less electricity by 2030 by installing existing technologies, like compact fluorescents or LEDs, insulation, double- or triple-paned windows, and on-demand or solar hot water heaters. Tuning up and optimizing settings on climate controls would also contribute.

Experts say that economy-wide efficiency improvements could have a head-turning effect on the U.S. energy mix, helping to halt climate change, reduce energy insecurity and fix the economy. Yet in the vociferous debate about how to get off fossil fuels, efficiency has taken a back seat — partly because of the difficulty of talking about it concretely.

"It's harder to talk about something that doesn't exist, that you don't produce," said Cathy Zoi, the assistant secretary for energy efficiency and renewable energy at the U.S. Energy Department.

Highlighting this blind spot is a recent book, "Invisible Energy: Strategies to Rescue the Economy

and Save the Planet," by David Goldstein, a physicist who won the MacArthur genius award in 2002 and works as energy program director at the Natural Resources Defense Council, a nonprofit environmental advocacy group.

Mr. Goldstein argues that the United States could reduce its projected energy consumption 88 percent by 2050, and that a 30 percent reduction is possible by 2020.

Other estimates are somewhat lower. The National Academy of Sciences study, on which he was a consultant, found that projected U.S. consumption could be cut 17 percent to 20 percent by 2020. McKinsey & Co., using prerecession consumption projections, put the potential reduction at 23 percent by 2020. The American Council for an Energy-Efficient Economy, an efficiency advocacy group, estimates the savings at 17 percent to 20 percent over the period, and 40 percent to 60 percent by 2050.

But Mr. Goldstein stands by his figures. "I found it very frustrating because if you're trying to do this in a sound, scientific way, you'll find that you're faced with a tradeoff" between being believable and being right, he said during an interview.

Mr. Goldstein looks at what is possible; other reports tally what is likely. Ms. Zoi said she had worked with Mr. Goldstein on efficiency issues for many years. "He pushes the envelope with the technical potential and he helps to define the debate," she said.

Mr. Goldstein argues that mistaken assumptions in mainstream studies have led them to greatly undervalue the potential gains. For example, he says, most look only at current technology without taking adequate account of technological change.

Steve Nadel, executive director of the energy efficiency council, agrees. "Even things like LED lighting and smart manufacturing, technologies in which we're investing lots of money to make them a reality, are not usually included in these studies," he said.

The academy report, for one, only counted existing technologies, Mr. Lave said, acknowledging that it probably underestimated true potential as a result. "The unlikely thing is that there will be no technological advances over what we have available today," he said.

Mr. Goldstein factors in potential gains from now-unknown technologies by extrapolating from past performance. The efficiency of refrigerators and air conditioning units, for example, has improved about 4 percent a year over the past 35 years, according to data from the Association of Home Appliance Manufacturers.

Ultimately, efforts will bump up against physical limits, but that point is still far away, he said. Ms. Zoi, who works on appliance standards for the energy department, agrees.

So do the manufacturers. In August, the association recommended that the U.S. government set standards to improve the efficiency of refrigerators, freezers, and washing machines 26 percent to 42 percent by 2015. The performances of other appliances would improve to a lesser degree.

Mr. Goldstein says that most reports also err on the side of perceived prudence because planners prefer a conservative approach: if they rely on potential efficiency gains rather than building new power plants, they risk taking the rap for future power outages. But that approach to supply security has a cost.

“When you’re deciding how much attention and money to throw at efficiency compared to other choices, a lowball estimate means you’re committing the country to very expensive resources when you could have spent a third as much,” Mr. Goldstein said.

Utilities are among those who favor a more conservative approach, partly because they have to pay fines in some states if they fail to meet efficiency targets. A report last year by the Electric Power Research Institute, a body financed by the energy industry, put the potential reduction in projected consumption at just 8.7 percent by 2020. Lisa Wood, executive director of the Institute for Electric Efficiency, part of a trade association for utilities, said she believed that a realistic target was somewhere between that figure and McKinsey’s 23 percent.

But Mr. Goldstein says his higher estimates are fully realistic — based on his experience working in California with the state’s recently retired energy commissioner, Art Rosenfeld, a pioneering innovator of efficiency policies.

Begun in the 1970s, California’s efficiency program implemented appliance standards and building codes and decoupled utility profits from electricity sales. The result has been to hold consumption steady despite a population growth of about 43 percent, making the state the most efficient per capita in the country.

“We halved per capita electricity use over the past 30 years,” Mr. Rosenfeld — who now advises the U.S. energy secretary, Steven Chu — said during an interview. “In terms of past trends,” he said, Mr. Goldstein’s estimate “is not as crazy as it sounds.”

The debate about the potential scale of efficiency savings matters because, aside from environmental benefits, it has a direct bearing on the economy.

"We spend about $1.1 trillion each year on our utility bills in this country," said Ms. Zoi, of the Energy Department. "And let's just say we could really easily reduce this by 20 percent. That's an extra $200 billion you could put into productivity of other things like health care, schools, businesses that grow."

Being more efficient would also make the U.S. economy more competitive. "There's a tremendous amount of energy — and money — to be saved in the commercial and industrial sectors," Mr. Lave said.

Still, the obstacles to efficiency are many.

"Policy makers are supportive of energy efficiency in concept, but there's this whole argument of 'just leave it to the market,'" Mr. Nadel said. Politically, too, building a power plant brings visible, vote-winning jobs, so "efficiency is everyone's second choice," he said.

But some market incentives are misaligned. "Major energy providers make more money out of kilowatt-hours that they sell rather than the ones that they don't sell," Ms. Zoi said.

Decoupling utility profits from the amount of energy sold, as California did in 1983, is a way to fix this problem, and it is a growing trend. Twenty-nine other U.S. states have since followed that lead or are about to do so, according to the Institute for Energy Efficiency.

Ms. Zoi said the U.S. Energy Department was giving the states information and grants to help them develop effective policies. One strategy is an energy efficiency resource standard, setting targets for annual efficiency improvements, accompanied by performance-based cash rewards or penalties. The institute says 25 states have implemented target-based incentives or are about to do so — mostly in association with decoupling.

Still, Ms. Wood said, the utilities trade group would rather see a federal cap on carbon emissions than an array of state standards. Mandates that impel utilities to adopt a set quota for wind or solar generation, or efficiency savings, can be difficult for managers, she said. "If everybody had to meet a carbon goal, then you'd do what made sense from a cost-effectiveness perspective, and the order would be energy efficiency first."

U.S. efficiency legislation is frequently included in energy or climate bills. But because these bills have politically controversial elements, efficiency policy languishes.

For example, the American Clean Energy and Security Act, which is currently stalled in Congress,

would set an efficiency savings target of 5 percent by 2020.

The House of Representatives and Senate versions of the Save American Energy Act, also stalled, call for 15 percent electricity savings and 10 percent natural gas savings in that period, which would eliminate the need to build 390 power plants, according to the energy efficiency council.

Progress is also hindered in both residential and commercial buildings by split incentives between landlords and tenants, Ms. Zoi said. Investments to improve a building's energy system are paid for by the owner, who usually does not pay the utility bills. "There's no incentive to make those capital investments," Ms. Zoi said.

The cost of energy plays a role, too. States with comparatively high prices for energy, like California, have made the most striking progress. Similarly, businesses were motivated to make upgrades and consumers to buy smaller cars when the price of oil hit $147 a barrel in July 2008.

Reluctance to change is evident in politics as well. Without real-world examples, policy makers are nervous about taking whole-of-economy steps, Ms. Zoi said. To combat this inertia, the American Recovery and Reinvestment Act has financed more than 7,000 efficiency projects, she noted.

But perhaps the biggest barrier to maximizing energy efficiency is the natural reluctance of people to try something new. Mr. Lave, chairman of the Academy of Sciences study, said the industrial sector was illustrative.

"It's clear there's a lot of low-hanging fruit around," he said. "It's also clear that companies are utterly uninterested" in making an investment unless it earns an annual return of at least 40 percent, he added. "It's not rational."

"The question is: Why don't you pick up these $100 bills that are lying on the floor?"