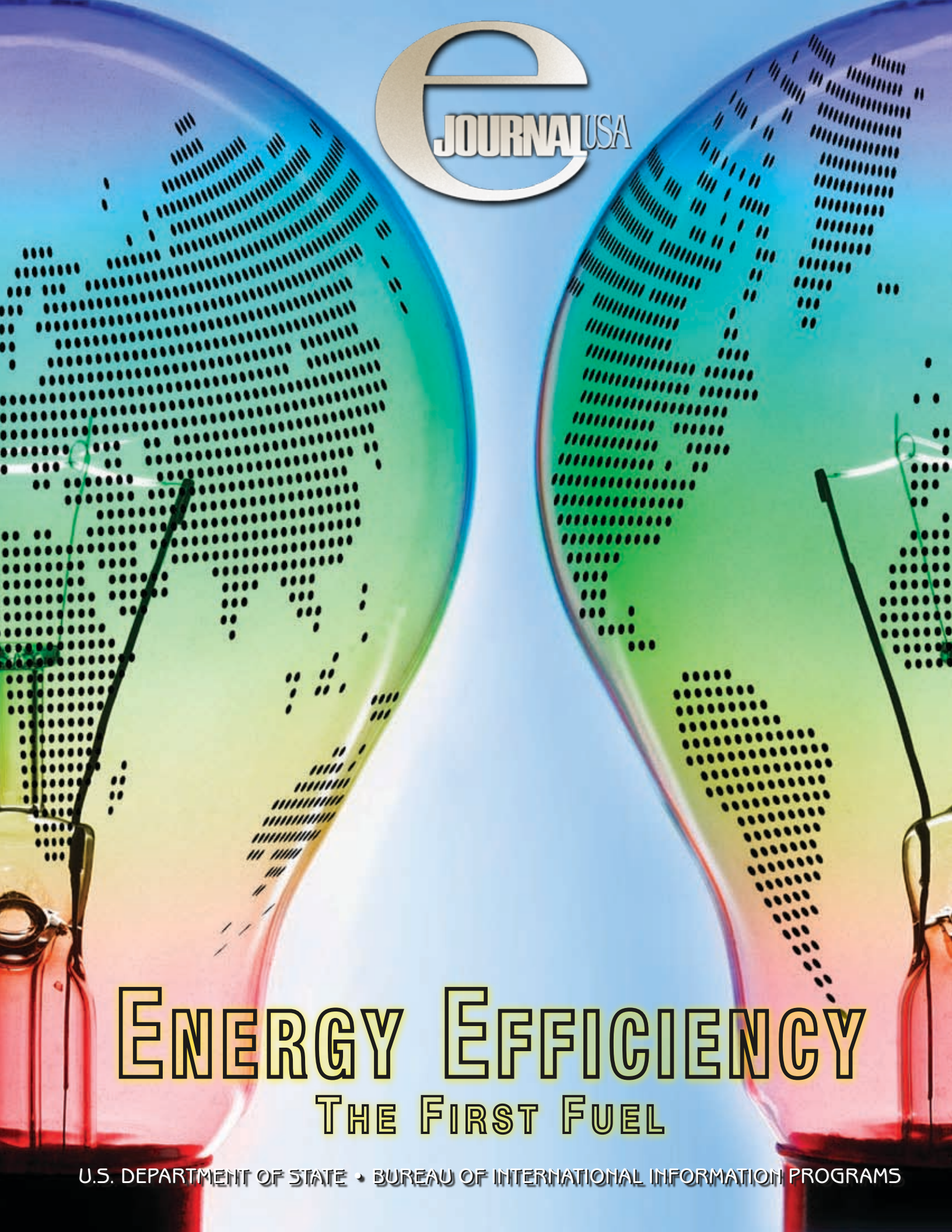

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# Energy Efficiency

## The First Fuel

U.S. DEPARTMENT OF STATE • BUREAU OF INTERNATIONAL INFORMATION PROGRAMS

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# About This Issue

Energy. Environment. Economics. All three forces contribute to standard of living and quality of life, and it has been true since the earliest humans learned to make fire and coax crops from the ground. The need to maintain a careful equilibrium among the three has taken on a new urgency in the 21st century. The carbon-based fuels that have fired productivity since the Industrial Age are dwindling in supply, contributing to climate change, and affecting the world economy.

Development of clean, renewable energy sources to replace carbon-based fuels on a massive scale is underway on many fronts. Until these efforts identify means for large-scale production and distribution of alternative energy, efficient use of existing supplies is widely acknowledged as the fastest, cheapest, and cleanest way to meet future energy needs.

Squeezing greater productivity from current energy consumption requires no increase in energy generation. In that way, efficiency costs less and is more readily available than any other form of production. With no increase in emissions, efficiency is also the cleanest source of energy.

Globally, the anticipated growth in energy demand is on an unsustainable course, and energy efficiency and conservation will play a key role in slowing that growth.

The United States has a strong record on tapping efficiency as a resource. The energy consumed to produce a dollar's worth of national output of goods and services has declined by more than 50 percent since 1970, according to the Energy Information Administration.

Further efficiency gains can yield even greater results, and on these pages you'll find some of the many strategies that individuals, organizations, and governments are using to achieve that goal.

A national plan for greater efficiency involves all the players in the nation's complex energy production and regulatory system, and in this journal, officials describe its goals. Energy Star, a cooperative initiative of industry, government, and consumers, boosts efficiency in homes and businesses nationally and internationally. Local governments also look abroad and learn from European efficiency. Consumers embrace the efficiency ethic in creative ways and build awareness in their communities.

© AP Images/Mark Duncan

A labyrinth of almost 483,000 kilometers of transmission lines comprises the U.S. electrical grid. Its fundamental design has changed little in more than a century and improving its efficiency is becoming a greater priority.

And experts with a global view explain how differing cultural norms can influence the effectiveness of efficiency strategies.

The Obama administration boosted government spending on efficiency programs by almost $17 billion in the economic stimulus package passed earlier this year, further affirmation of the national imperative to tap the resource of energy efficiency. ■

*— The Editors*

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# Energy Efficiency: The First Fuel

## A TRULY GLOBAL ISSUE

**4 Energy Efficiency: Easier Said Than Done**
An Interview with Matthew H. Brown and David Fridley
Two experts with broad U.S. and international experience discuss the many strategies that various national and local governments have attempted to encourage energy efficiency.

**9 An Oil Giant Dreams Green**
Bryan Walsh, *Time* Magazine
Abu Dhabi, one of the world's largest petroleum producers, has launched the Masdar Initiative, a multibillion-dollar project to establish the emirate as a center for efficiency and energy innovation.

**11 Virginia Learns Energy Innovations from Abroad**
Dale Medearis, Senior Environmental Planner, Northern Virginia Regional Commission (NVRC)
Local officials from Northern Virginia trade ideas on climate adaptation, energy efficiency, and renewables with counterparts in Europe.

## EDUCATING CONSUMERS

**14 Stimulating Efficiency for the Long Term**
Stacy Angel, U.S. Environmental Protection Agency, and Larry Mansueti, U.S. Department of Energy
The U.S. energy industry and the officials who regulate it have joined forces to develop and implement new ways to bring greater efficiency to the nation's entire energy infrastructure.

**17 U.S. Efficiency Advances in 2009**
A summary of efficiency initiatives in the American Recovery and Reinvestment Act of 2009.

**18 The Ever-Expanding Universe of Energy Star**
Kathleen Hogan, Director of the Climate Protection Partnerships Division, U.S. Environmental Protection Agency
Energy Star, a U.S. government flagship program advocating efficiency, has significant influence on energy consumption in homes, businesses, and industry.

**21 Blogging for Efficiency**
Citizens describe how they are changing their homes and habits.

**23 An Energy Revolution by the People**
Elisa Wood, Contributor, www.RealEnergyWriters.com
Real gains in energy efficiency must be made by consumers one at a time, and many are encouraging creative efficiency measures in their communities.

**26 Vampires in the House**
Many common household appliances consume energy even when they are not in use.

**27 Promoting Citizenship Through Energy Efficiency**
Fábio Palmigiani, Freelance Journalist
Brazilian power companies work to educate customers about becoming legitimate bill-paying customers, leading to safer neighborhoods and a path to citizenship.

**31 Oil Companies Embrace Efficiency**
Patrick Crow, Freelance Journalist
Big oil companies are running major ad campaigns to get consumers to use energy more wisely, demonstrating just how serious the energy efficiency movement has become.

**33 Big Oil Goes Green**
Large U.S. oil companies' campaigns on energy efficiency are summarized.

**35 Additional Resources**
Books, articles, Web sites, and films on energy.

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## Effici-Fact

Energy conservation is any behavior that results in the use of less energy. Energy efficiency is the use of technology that requires less energy to perform the same function.

*Source: The National Energy Education Development Project, whose mission is to promote an energy-conscious society. The NEED Project creates networks of students, educators, and business, government, and community leaders to design and deliver energy education programs.*

# Energy Efficiency: Easier Said Than Done

## An Interview with Matthew H. Brown and David Fridley

© AP Images/Imaginechina

Air conditioning units fill the windows of a building in China's Jilin province. A 2008 Chinese law forced manufacturers to increase the efficiency for these units and other appliances.

*Achieving energy efficiency sounds like a self-evident goal. Of course you want to use energy efficiently, who wouldn't? But when you begin to analyze the myriad ways energy forms part of our social and economic infrastructure, and weigh the cost versus benefits of wringing more productivity from every energy dollar, you realize how complex the pursuit of efficiency becomes. Historically, increasing energy efficiency has received great attention when prices are high, but less so when prices fall.*

*Businesses and industries, and national, state, and local governments undertake the challenge in many ways. Charlene Porter,* eJournal USA *managing editor, talked to two experts who have watched public officials and business enterprises test a variety of policies to achieve energy efficiency in their operations in the United States and abroad.*

*Based in Centennial, Colorado, Matthew H. Brown is a partner with ConoverBrown, a consulting firm working with state, local, and international governments on energy issues.*

*David Fridley is staff scientist in the Environmental Energy Technology Division at the Lawrence Berkeley National Laboratory in San Francisco. He's also working with the China Energy Group, helping China move toward sustainable development through energy efficiency.*

**Question:** Energy efficiency has been an issue in public discussions for decades now. Though it might sound simple enough, is there a single, well-defined way to achieve energy efficiency?

**Brown:** There is no single magic bullet or method to

achieve energy efficiency. Energy efficiency comes about through a mixture of government policies and private-sector initiatives, through voluntary programs and standards, through mandatory codes, through financing mechanisms to support it. It's a clever mixture of all of those elements which eventually gets you to something that is more efficient.

**Q:** What's the perspective on that question from the Lawrence Berkeley National Laboratory, David Fridley? Have your scientists found a straight line to get to energy efficiency?

**Fridley:** Getting there is difficult. Each of us demands some kind of a service from energy. That might be light to read by, heat for comfort in our homes, or locomotion and transport. Really, the whole concept of energy efficiency is: How do we get more of those services delivered to us using less energy? Therein lies the rub. Sometimes it is a technology fix; sometimes it is a behavior change. All of these things have a dual outcome. In terms of society, the purpose of energy efficiency is to save energy. If you save energy you reduce emissions, and you reduce some of the environmental consequences of having produced that energy.

For you and me, as consumers, the consequence of energy efficiency is saving money. There are two different motivations involved. If energy efficiency saves you money, why doesn't everyone automatically do it? It is a combination of lack of understanding, or split incentives, or "market failures" — as we broadly call them – that have to be addressed through approaches and policies and technologies that Matthew mentioned.

**Q:** Matthew, you worked on this issue in many jurisdictions, in state, local, and national governments, on a couple different continents. Do you see particular cultural predispositions that might complicate — or maybe facilitate — a plan to energy efficiency?

**Brown:** Everybody is struggling with the same basic things that David mentioned, but yes, there are absolutely cultural predispositions that emerge in this policy area. When I was working at the International Energy Agency in Paris as a consultant for a couple years, I learned about some Japanese conservation programs that reflected the importance of "saving face" in Japanese culture. The programs were called the Top Runner programs, and they rely heavily on the idea that if you as a corporation fail to comply with the program goals and commitments you've made in an energy efficiency initiative, it is publicized that you haven't complied.

**Q:** A company is exposed as a public failure?

**Brown:** Yes, so while the standards are voluntary in a sense, there is a strong incentive to comply.

Now, would that same type of penalty be as effective in North America or South America? Or in Europe? It probably wouldn't have the same effect. When you get to the design of things like penalties and incentives, I think you end up with some very different programs. The United States has tended in the last decade or so to rely on financial incentives and to shy away from codes or mandates. I think that is more peculiar to the United States, contrasted to a number of European countries, which have been able to rely more effectively on mandates and standards and codes.

**Q:** David, how do you see the inclusion of China's cultural norms in the implementation of its efficiency policies?

**Fridley:** There are very distinct cultural differences in energy efficiency programs. In the United States, we rely heavily on self-policing for compliance to mandatory minimum efficiency standards for appliances, for example. That is because we have a culture in which competing companies are always aware of what other companies are doing: They buy each other's products; they test how they perform. If they find someone cheating, they have no qualms about reporting that discrepancy to the media or to the government. In China, companies do not have a culture of reporting on cheating by other companies. So self-policing has not been an effective way to achieve compliance.

We are working with the Chinese government to come up with various policies to promote enforcement and compliance. One of them is very much reliant on this cultural trait of shame that Matthew mentioned with regard to Top Runner. They are annually doing some spot-testing of appliances for compliance to the efficiency standards, and the names of those who aren't meeting the standards are publicized.

**Q:** The U.S. Energy Star program gives the equivalent of a "good citizen" award to appliance manufacturers who build efficient products. Would you say that is based on the cultural converse?

**Fridley:** That's a very interesting example. I spent many years working with the U.S. Environmental Protection Agency [EPA] on China's comparable energy efficiency product labeling program. One of its aims was to transfer much of the experience and procedures from the successful Energy Star program to the Chinese program.

But here's where the cultural difference came into it. Energy Star is in part successful because it is aimed at communicating with the consumers buying the final product. The idea is to make consumers want to choose the energy-efficient product. That's the whole point of a voluntary program. You have to orient your message to the consumer, promote your program, and work with manufacturers, retailers, and public sector entities. It's been a very effective approach in the United States.

In China, there is no cultural tendency to pander to the consumer. It's a country where the manufacturing sector dominates and has the biggest voice on what happens. So even though they have developed this voluntary energy efficiency label, it has gotten nowhere near the traction of Energy Star, because they aren't really out there replicating that attempt to attract consumers.

China is the workshop of the world and, in view of the global economic downturn, is now facing enormous overcapacity in virtually every sector. So it is cutthroat competition. Manufacturers have liked the endorsement label because it is a way for them to distinguish themselves from competitors who are producing the exact same thing as they are producing.

A couple years ago, we had a program in which the United States, Australia, and China jointly developed a minimum efficiency specification for external power supplies, those little brick-like units that charge your mobile phone, laptop, and so forth. The Chinese industry produces about half of these made in the world. It is a low-profit-margin business with high competition, so earning that high-efficiency mark was desirable as a way for them to distinguish themselves from the rest of the pack of manufacturers, and perhaps gain a bit of a commercial advantage.

**Q:** We've mentioned some cultural obstacles to adaptation of energy efficiency programs from one nation to another, but Matthew, you must have also encountered some programs where an adaptation was made successfully?

**Brown:** Energy Star is probably one of the more successful voluntary programs. EPA has made an active effort to work with other governments. The other would be in the area of labeling of buildings. A number of European countries have taken the lead in developing building-labeling programs. There's been a lot of interest in the United States in mimicking those labeling programs. Typically what they do is disclose the energy use characteristics of a building, and will also very often reveal the emissions effect of a given building.

**Q:** How widely is this being done in Europe?

**Brown:** This is getting quite a lot of use in a number of European countries, and it's getting a lot of attention in U.S. states.

Another concept that is getting some interest is "white tags." The idea is that utilities are required to reduce their sales by X percent — 1 percent per year, for example. In order to comply with the requirement, they must own enough white tags to meet the requirement. One white tag is equivalent to a predetermined amount of energy sales reduced — one MWh [megawatt hour], for example. The utilities can buy that white tag from a company that has reduced its energy usage by one MWh and verified that reduction. This system is both a compliance mechanism — since the utility must own enough white tags to meet its efficiency requirements — and it provides a new source of revenue for companies that invest in energy efficiency. It's a program that is having some success in Italy and a number of other European countries, and has provoked some interest in the United States. Connecticut has probably made the most progress with this approach.

**Q:** So far, we've talked about programs where a government body is the leading player, and in others, industry is the principal player in bringing about energy efficiency. David, how does this leadership issue play out in China with its history as a command economy?

**Fridley:** There have been dramatic changes in China in that regard. What really characterizes the change is that two decades ago a great portion of China's economy was in state hands. Today most of the economy is not in state hands; it's in private ownership. The government had used some policies very effectively in the 1980s and 1990s, such as setting energy quotas, doing energy audits, establishing energy efficiency service centers, forced retirement of old equipment, and so forth. They worked well in a command-and-control economy where the government was really driving this to push down the energy intensity of the economy. But those policies pretty

much disappeared as more and more of the economy went into private hands.

The struggle of the Chinese government in the 2000s is to find market-friendly policies that can achieve these same goals and that don't rely on command-and-control measures. This has led to a different kind of partnership between government and business. About 65 percent of China's energy is consumed by industry, so that is the critical area. In the United States, we tend to focus more on commercial and residential because industry does well on its own, and it is a much smaller part of our economy.

© AP Images/Julien Behal

Governments can create a variety of incentives to nudge citizens toward improving energy effficiency or conservation. The Irish government adopted tax incentives in 2008 to encourage more people to cycle to work, a measure celebrated here by Environment Minister John Gormley and Green Party politician Deirdre de Burca in Dublin.

In China the question is: How do you introduce efficiency policy into the industrial sector? One of the approaches they took was to look around the world and see what worked elsewhere. We helped them to compile industrial efficiency policies from around the world. After numerous workshops with the government and industrial organizations, everyone agreed to attempt to adapt the Dutch voluntary agreements. This was a negotiation between the Dutch government and a dozen industrial sectors to reduce their emissions by a certain percent by a certain year. It was successful and, in some sectors, exceeded their goals.

The Chinese decided to adopt this as a pilot in the iron and steel sector in Shandong Province. Basically the government stepped back from the project, saying, "We will provide you with technical assistance, energy auditors, and other experts." What turned out in the end to be most valuable to the companies was that the government promoted and advertised their successes. Again, steel is a high-volume, low-margin industry in China, so for these iron and steel companies to say, "We are energy efficient and the government recognizes it," that was very valuable to them.

That really demonstrates the change in the government-business relationship over the last 10 years or so. The move has been toward government setting policies and direction and business implementation.

China has experienced its own energy crisis because their energy consumption has soared as the economy boomed in the last few years. That's brought about a move from voluntary agreements to actual mandates for efficiency procedures with quantitative targets that each sector must meet. Instead of telling each sector how to meet those targets, the government set a requirement for a certain amount of energy savings that the industries must meet, and each sector is on its own to figure out how to do it. Some of the international assistance in this regard is to create tools to help each sector — iron and steel, chemicals, refining, cement-making — to evaluate their operations to figure out how they can best reach the targets for lowered consumption.

**Q:** If there are so many ways to design an energy efficiency program, how is anybody supposed to get started?

**Brown:** The most effective programs are always going to be some sort of combination of approaches: the mandatory, regulatory approach; the incentives; and the consumer education and information approach.

There are five categories of things you can do to boost energy efficiency. In the mandatory area, you have efficiency resource standards, sometimes called efficiency portfolio standards. Then you have appliance standards and building codes as your options for regulatory action. The other approach is in the creation of incentives. Those could be financial incentives for individual homeowners, individual companies, businesses, and so on. They could be incentives for utilities to act in a certain way, known as

performance-based incentives. Then finally, you have the information and education programs such as Energy Star.

The U.S. experience is instructive and interesting because efficiency activities are unfolding in two different ways at the same time. You have actions coming from the federal government and from the states. Those two levels of government have been approaching the efficiency issue in different ways. The federal government has shied away from strengthening codes and standards in recent years, so the innovation in that area has been at the state level. The states, to the extent that they can, have been developing more efficient appliance standards, stricter building codes, and energy-efficient resource standards in addition to financial incentives. The federal government has focused more on incentives. So it has been interesting to watch these two approaches unfold.

**Q:** Describe for me one of the most effective efficiency initiatives you've ever seen.

**Fridley:** My favorite was watching a program that managed to dovetail solutions to two environmental goals at once. Under the Montreal Protocol to eliminate emissions of chlorofluorocarbons, China faced having to phase out use of CFCs in refrigerators and air conditioners. At the same time, they had started engaging internationally about how to improve and extend their efficiency standards. So one of the more effective efficiency programs I've seen in recent times was the CFC-Free, Super-Efficient Refrigerator Program. The idea was that if refrigerator manufacturers were redesigning compressors and other components to get rid of CFCs, they could increase the efficiency at the same time. It was extremely successful.

**Brown:** I have a couple of favorite programs. One is standards for a variety of household appliances. California really has been the leader in putting together appliance standards, researching where efficiency levels should be set, working with manufacturers to do so. They have also done some work on compliance and enforcement, though that has been limited. One of the successes of the California-based standards is that they have been mimicked in numerous other states. And they have been mimicked in federal legislation. So there's been a percolating-upward of appliance standards that were set initially in California.

The other one I liked is a financing program run out of Connecticut. It is an "on-bill" financing program, right on the utility bill. What happens is the utility will help you identify what measures you can install to make your small business more energy efficient. They offer rebates to bring down the cost of these improvements. Then they will fill in the rest of the cost of the efficiency improvements with a loan, typically a zero percent interest loan. As a result of the combination of the rebate and the zero interest loan, the customer is in a net cash-positive position from day one, and paying for the efficiency improvements through their energy bill. They don't have a separate bill to pay. That's been mimicked in a couple of states, and it's an effective program because the customers are in that net cash-positive position from the outset, because it is easy for customers to engage in and sign up for, because it's done working through the private sector, since contractors actually install the efficiency measures. ■

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*The opinions expressed in this interview do not necessarily reflect the views or policies of the U.S. government.*

# An Oil Giant Dreams Green

Bryan Walsh

*Abu Dhabi, the wealthy capital of the United Arab Emirates, is among the world's largest petroleum producers, seemingly an unlikely place to find a large-scale investment in efficient and renewable energy technologies. But the leaders of Abu Dhabi are looking to the decades ahead when their nation's greatest resource goes dry. They have embarked on the Masdar Initiative, a multibillion-dollar push to establish the emirate as a center for clean-technology development and innovation.*

*Bryan Walsh is a staff writer for* Time *magazine, where this article first appeared February 23, 2009.*

The gulf emirate of Abu Dhabi got rich on the back of black gold, but its planned carbon-free city could represent the future of environmentalism.

Sami Khoreibi can't stop smiling. The baby-faced chief executive officer of Enviromena Power Systems, Khoreibi launched his business a little over a year ago. Now he is looking over a 10-megawatt solar farm in the desert outside the city of Abu Dhabi, with row after row of solar panels angled to the Middle Eastern sun like bathers lying poolside. The solar farm is the earliest tangible part of Abu Dhabi's Masdar City, a $22 billion project designed to be the world's first zero-carbon-footprint, zero-waste settlement — the embodiment of this oil-rich Arab city's surprisingly green dreams. "This is bringing attention and capital from around the world to Abu Dhabi," says Khoreibi. "We're going to use this as a launching pad for clean development."

Courtesy of Foster + Partners

Masdar City, seen here in an architectural drawing, will be a 6-million-square-meter development that strives to be a carbon-neutral and zero-waste community. Abu Dhabi leaders want the development to be a world model for technological innovation in efficiency and sustainability.

Abu Dhabi is the last place you might expect to find the future of environmentalism. The wealthy capital of the United Arab Emirates is the world's eighth biggest producer of petroleum. But the leaders of Abu Dhabi know — perhaps better than most — that the oil won't last forever, so they have embarked on the Masdar Initiative, a multibillion-dollar push to establish the emirate as a center for clean-technology development and innovation. Those plans include Masdar City, designed by British architect Norman Foster, as well as a $250 million clean-tech investment fund and an energy-engineering school linked with the Massachusetts Institute of Technology. If it all works, this desert emirate could become the Saudi Arabia of renewable energy and a living model for the way technological innovation could defuse the threat of climate change. "This is really a very powerful image," says Rajendra Pachauri, chair of the Intergovernmental Panel on Climate Change. "It clearly shows that a country that has no immediate economic need to diversify its energy production is willing and able to do so."

Abu Dhabi's leadership is all the more necessary at a moment when once-vibrant green businesses are flagging, thanks in part to the plummeting price of oil. In the United States and Europe, new wind- and solar-power installations are slowing, energy start-ups are starving for

funds, and some green companies are laying off workers. But it's still full speed ahead in Abu Dhabi, where last month's World Future Energy Summit (WFES) attracted more than 16,000 visitors and companies that ranged from General Motors to modest Chinese solar manufacturers. And with a new administration in Washington struggling to keep its own ambitious green agenda on track, Abu Dhabi kept the momentum going at WFES by announcing that at least 7 percent of its electricity would come from renewable sources by 2020, up from nothing today. Nor, said Masdar officials, would the recession have a major impact on the emirate's plans, announced last year, to invest $15 billion in clean energy — an amount equal to what President Barack Obama has suggested spending annually for the entire United States. "We are looking beyond the current financial crisis," says Sultan Ahmed Al Jaber, Masdar's CEO. "But all our projects are still proceeding."

Those plans include a thin-film solar factory, along with investments in wind and solar and in carbon-trading projects throughout the world. Most significantly, Masdar is pioneering a model carbon capture and sequestration (CCS) project with the energy and mining giants BP and Rio Tinto that will take $CO_2$ emissions from industry in the emirate and store the $CO_2$ in abandoned oil wells. Since even the most optimistic energy projections assume we'll be burning fossil fuels for decades, perfecting CCS is vital to controlling emissions — and who would be better suited to cleaning up fossil fuels than an emirate that produces nearly 3 million barrels of oil a day? "It's hugely significant that Masdar is championing this," says Vivienne Cox, BP's head of alternative energy.

But the heart of the initiative is Masdar City, a community designed for 40,000, set to be completed by 2016, that bills itself as the city of the future. Cars will be banned, so residents will be whisked around the city on a personal rapid transit (PRT) system, an automated cable-car-like network. (The PRT cars, unveiled at WFES, look as if they were stolen from the set of *Star Trek*.) More prosaically, the 2.3-square-mile (6-square-kilometer) walled community will have a solar-powered desalination plant, and conservation will keep water use 60 percent below the norm. The city's centerpiece will be the Masdar Institute, a graduate academy that will churn out new experts in clean energy. The hope is that a pool of educated workers — plus Masdar's favorable tax policies — will draw green companies to the desert, where they will be able to test their ideas in an environmental Utopia. "There is a visionary component to it," says Frank Mastiaux, CEO of climate and renewables for E.ON, a German energy company. "Masdar and Abu Dhabi have set themselves incredibly high expectations. Now they have to be delivered."

For all the limitless funding Abu Dhabi can pour into Masdar, however, success is not guaranteed. Some urban-design experts question just how sustainable Masdar City will really be. The settlement is being built miles outside Abu Dhabi, contributing to the energy-intensive sprawl growing throughout the emirate. And while Masdar City promises to use the greenest technologies on the market, that won't make it livable. "It looks a bit like a prison to me," says Steffen Lehmann, an urban-design professor at the University of Newcastle in Australia who spoke at WFES. "It's going to be a 1 percent token-green enclave, while the rest of [Abu Dhabi] goes about business as usual."

And business as usual in Abu Dhabi is extremely carbon-intensive. Gasoline costs less than 50 cents a gallon (13 cents per liter), and public transport is all but nonexistent. The World Wildlife Fund says the United Arab Emirates has the biggest per capita carbon footprint in the world, and parched Abu Dhabi uses more water per person than anywhere else. There are no plans to put a price on carbon, as even the United States is considering. Lehmann and others would prefer to see Masdar spend its billions greening Abu Dhabi itself, not building an entirely new settlement in vacant desert. "We have to have every city be an eco-city," Lehmann says.

He's right, but that doesn't diminish the significance of the Masdar Initiative and its high-tech approach. Environmentalists are slowly realizing that a policy of regulation — so successful in combating past pollution problems like acid rain — simply won't be enough for global warming. The scale of the climate crisis is too vast, and the world's growth too rapid. What's needed is technological innovation, green solutions as yet undreamt of, to utterly remake the way people use energy. Masdar's crash greening may be the future. "This is real, and it shows that they are thinking ahead in a constructive way," says Nicholas Stern, an influential British economist and advocate for action on climate change. "I'm very optimistic that this is happening." Given the challenge, the world needs all the optimism it can get. ■

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# Virginia Learns Energy Innovations from Abroad

Dale Medearis

Courtesy WMATA/Photo by Larry Levine

Signs mounted over train platforms in the Washington, D.C.-area Metro system provide passengers with "real-time" information about the status of trains, allowing them to adjust their travel plans and routes if necessary.

*For more than a decade, local officials from Northern Virginia and counterparts from Europe have traded regional environmental planning innovations. The partnership is expanding its focus to climate change mitigation and adaptation, energy efficiency, renewable energy, and green buildings policies.*

*Dale Medearis, Ph.D., is the senior environmental planner with the Northern Virginia Regional Commission (NVRC), where he manages climate, energy, and international programs. Prior to work with the NVRC, Medearis spent approximately 20 years at the U.S. Environmental Protection Agency's Office of International Affairs, managing the agency's programs for Europe and international urban environment.*

Hundreds of thousands of times a day, travelers on the Metropolitan Washington Metrorail system stand on the platform and stare expectantly down the tracks for an oncoming train. Their eyes frequently shift upward to a constantly updating electronic sign hanging above the platform. It tells passengers how many minutes until the arrival of the next train, and the train after that.

In the past, commuters in the 170-kilometer system had little information about when the trains might come and go. Now, commuters have real-time information about the travel status of trains and buses because transportation planners here borrowed some ideas from cities such as Berlin and Stockholm.

The display of these signs at Metro stations, the adoption of traffic-calming measures to reduce speeds, and the convenience of car sharing have become permanent parts of the commuting routine for travelers in the region.

© AP Images/Jacquelyn Martin

A steady stream of bumper-to-bumper traffic pours out of Washington, D.C., into Northern Virginia at the end of every working day. Some studies have shown that drivers in this metropolitan area spend about 40 hours each year stuck in the region's traffic.

When residents and pedestrians in Fairfax County wanted greater safety on neighborhood streets, they looked to the traffic circles and street designs from Stuttgart, Germany. The plan now in development will transform a deadly intersection into a walkable, pedestrian-friendly streetscape.

The citizens of Alexandria, Virginia, enjoy car-sharing programs patterned after those in Berlin and Zurich, which offer reliable, clean, and affordable access to cars without worries of storage, maintenance, or pollution. The success of these schemes not only improves mobility in a transportation-stressed region, but also represents the evolving influence of "soft diplomacy" and the ascendance of state and local governments as laboratories for the transatlantic transfer of innovations into the United States.

## Sharing Solutions

The Northern Virginia Regional Commission (NVRC) is a council of local governments for the approximately 2.5 million residents of a state on the southern boundary of the nation's capital. Its regional counterpart in Stuttgart, the Verband Region Stuttgart, is a comparable council for 2.5 million residents. The two bodies have developed a model partnership focused on the sharing and application of innovative regional environmental, planning, and transportation plans. Since 1998, the Verband and NVRC have brought together professionals and policymakers to learn from each other in the areas of land-use planning, water infrastructure, transportation, green design, and stormwater management policies. As a result, environmental planning in Northern Virginia has been transformed.

Our work with Stuttgart — and other European regions — is easy to justify. By most energy, climate, or environmental benchmarks, European regions such as Stuttgart outperform the United States. For example, since 1990, Germany has reduced its greenhouse gas emissions nationwide by more than 8 percent. Over the same period, according to the U.S. Energy Information Administration, greenhouse gas emissions in the United States increased by more than 10 percent. Moreover, Germany's renewable energy sector overall accounts for more than 12 percent of total electricity production and has created more than 250,000 jobs since 1998. By comparison, in the United States, renewable energy accounts for less than 3 percent of all energy production. It is estimated that the total installed solar photovoltaic capacity in Northern Virginia does not exceed 50 kilowatt hours (kWh) — less than that of the train station in Freiburg, Germany.

As Northern Virginia looks ahead to the challenges of confronting climate change, balancing economic growth, and providing housing and mobility for the 500,000 new residents expected in the region by 2019, the imperative to draw lessons from Stuttgart and other European regions will become even stronger. More than two-thirds of greenhouse gas emissions in our region, as in the rest of the country, emanate from the "built environment." This includes the heating and cooling of houses, apartments, and commercial and public buildings and the fuels consumed shuttling commuters to and from their jobs. State and local governments in the United States exercise huge influence over the built environment — with the power of building codes, energy efficiency standards, permits for renewable

energy, and the building and maintenance of roads and public transit. Simply put, state and local governments are at the center of global energy, climate, and sustainable policies. As the world's attention turns to the challenges of energy and climate, the exchange of knowledge about the built environment will become vital.

Northern Virginia and Stuttgart have taken a number of new steps to support the transfer and application of innovations in climate and energy policy. A 2008 meeting with German counterparts in Hamburg, Erlangen, and Stuttgart reaffirmed that a broad range of practices and policies can be shared from Germany to Northern Virginia over the short-and long-term. These include:

*Community Energy Planning*. Climate and energy planning in Virginia requires widespread adoption of energy-efficient design in buildings and housing, efficient generation and distribution of renewable and conventional energies, along with mixed and compact land uses frequently built around transit centers. These measures must be supported by clear, short- and long-term energy efficiency and greenhouse gas emissions reduction targets. Hamburg's HafenCity and Stuttgart's Scharnhauser Park are models of community energy planning with plenty of lessons for Virginia cities such as Alexandria and Arlington, and also in the greater metropolitan area of Washington.

*Renewable Energies*. Development and expansion of renewable energies (wind, solar photovoltaic, solar thermal, and geothermal heating and cooling) in Northern Virginia can be enhanced through governmental incentives, such as "feed-in tariff systems." Feed-in tariff systems in Germany encourage the production of renewable energies through a government guaranteed purchase rate, generally set above conventional rates.

*Energy Performance Building Labels*. The promotion of energy efficiency can be accelerated in Northern Virginia, especially in the process of retrofitting buildings. The display of energy labels on a structure to record and broadcast its energy efficiency and performance is a further strategy to step up efficiency efforts.

*Building Retrofits and Financing*. Local governments in Northern Virginia should consider development of a publicly administered capital fund that administers low or zero interest loans for renewable energy applications, insulating or weatherizing private homes and commercial businesses.

## Shared Challenges

The ongoing work and achievements of international partnerships at the local level are often overlooked. U.S. and international media give disproportionate attention to the differences within multilateral policy debates on climate change. But state, local, and regional governments have played, and will continue to play, an equally significant role in affecting sustainable energy and climate policies. The overwhelming convergence of shared challenges among local authorities creates fertile ground for the search, exchange, and transfer of innovative energy and climate solutions. The transfer of innovative policies from abroad to the United States should accelerate and become more focused and persistent.

The globalization of the economy also will sustain and expand ties between cities and states — especially between Europe and the United States. The mutual trade and financial investments between the United States and Europe exceed $4 trillion annually and account for millions of jobs. The powerful economic interdependence between Europe and the United States will sustain learning and exchanges among state and local authorities. These issues give officials in the United States a motivation to work with counterparts in other countries in search of solutions to mutual problems. These exchanges are a form of soft diplomacy that can only help improve international relations and mutual understanding among nations.

## Conclusion

President Obama's chief environmental and climate advisor, Carol Browner, affirms that climate change is the "greatest challenge we have ever faced." The science that has emerged clearly suggests that Northern Virginia will not be immune from these challenges. In that context, the partnership between Northern Virginia and Stuttgart can demonstrate to leaders facing similar challenges in other communities around the world that international partnerships and cooperation — especially between local authorities, business interests, and civil society organizations — are not only valuable, but critical to the search for and implementation of long-term global climate and energy solutions. ■

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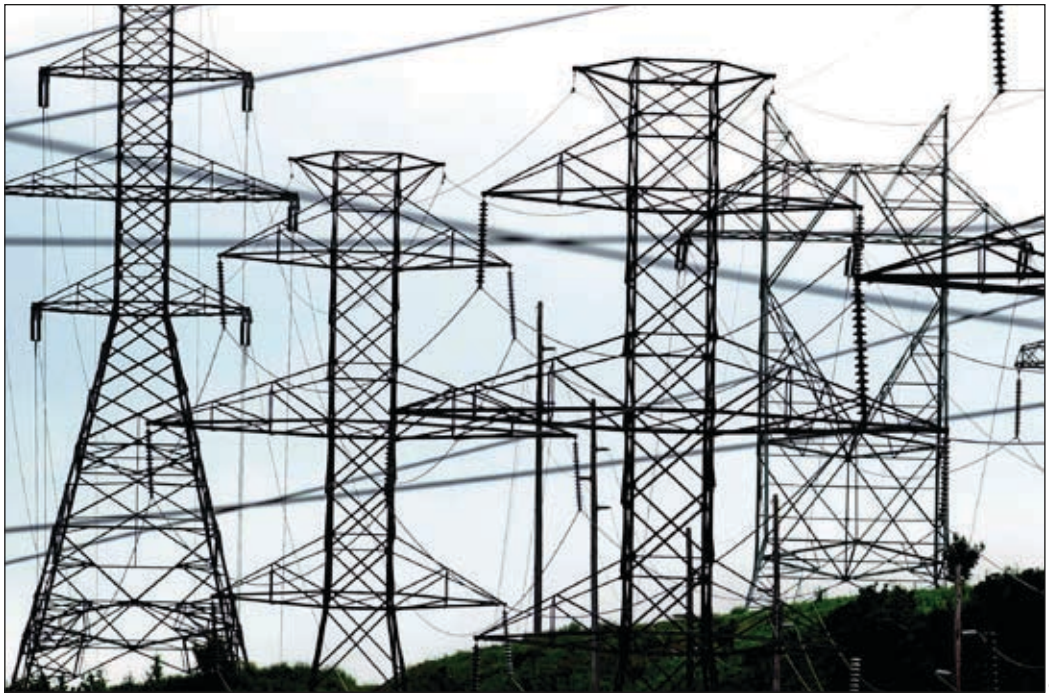
*The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.*

# Stimulating Efficiency for the Long Term

Stacy Angel and Larry Mansueti



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Electrical power lines stretch across a Pennsylvania mountaintop. Widespread regional blackouts in recent years have revealed weaknesses in the nation's electricity transmission system, which industry and government officials now work to correct.

*Oil prices reached a record peak in mid-2008, then spiraled downward in tandem with world economies. A new president took office in the United States, and the economic crisis became Item One on his agenda. President Obama has vowed to place the conjoined issues of energy and economics at the forefront of his recovery plan. But years before this crisis erupted, the U.S. energy industry and the officials who regulate it joined forces to develop and implement new ways to bring greater efficiency to the nation's entire energy infrastructure.*

*Stacy Angel and Larry Mansueti oversee federal assistance to the National Action Plan for Energy Efficiency. Angel is in the Environmental Protection Agency's Climate Protection Partnerships Division, where she supports voluntary efforts to reduce carbon emissions through clean energy, including energy efficiency. Mansueti is in the Department of Energy's Office of Electricity, where he supports senior management on electricity policy matters and assists states working to enhance efficiency in electricity regulatory policies.*

The American Recovery and Reinvestment Act of 2009 became law on February 17, stimulating an unprecedented level of energy efficiency investment in the United States.

Investing in more efficient technologies and practices in our homes, businesses, schools, governments, and industries — which account for 70 percent of natural gas and electricity consumption in the United States — is one of the most constructive, cost-effective ways to create new jobs. At the same time, such investment will address the challenges of high energy prices, energy security and independence, environmental concerns, and global climate change in the near-term. Mining this efficiency could help the United States meet on the order of 50 percent or more of the expected growth in consumption of electricity and natural gas in the coming decades, saving billions of dollars in energy bills and avoiding significant emissions of greenhouse gases and other air pollutants.

Recognizing the large opportunity for energy efficiency, more than 60 leading organizations

representing diverse stakeholders from across the country joined together to develop the National Action Plan for Energy Efficiency in 2006. Many of these stakeholders are the very groups that can deliver energy efficiency — electric and gas utilities, their corresponding state regulators, and others.

The Action Plan identifies the key barriers contributing to underinvestment in energy efficiency, outlines five key policy recommendations for achieving its goal of all cost-effective energy efficiency, and offers a policy framework — Vision for 2025 — to achieve and measure progress towards the goal. Barriers to greater investment in energy efficiency are widespread, among customer types and within the energy utility companies. For example, customers who do not pay their energy bills directly, such as in some rental housing, do not have an incentive to spend more on energy-efficient lighting or televisions because their landlord will reap the monthly utility savings. We call this the "split incentive" barrier to energy efficiency. In addition, utilities may be able to reduce their costs to serve all customer energy demands by supporting energy efficiency, but "best practices" program approaches for delivering these savings are not always well-documented and often not captured in utility energy planning or funding efforts.

© AP Images/Kevork Djansezian

Sweltering heat and the loss of an important transmission line caused a power failure for half a million Californians in 2005. Tracy Bibb, director of operations at California Independent System Operator, points to a model of the grid showing the million-volt line that went out of service.

The Action Plan has received broad support by states, utilities, and customers across the United States. To date, more than 120 organizations have endorsed the Action Plan recommendations and made public commitments that will help advance Vision for 2025. The U.S. Environmental Protection Agency and the U.S. Department of Energy only facilitate the work of this public-private initiative, and thus the positions and statements are those of the Action Plan members themselves. It's a powerful message endorsed by a wide cross-section of decision makers from across the United States.

Vision for 2025 is the flagship document of the Action Plan. Given the U.S. utility regulatory structure, many of the policies to remove barriers to energy efficiency must be advanced at the state level. Therefore, the Action Plan's Vision for 2025 offers a policy framework for advancing all cost-effective energy efficiency, while recognizing the diversity of regional, state, and local circumstances and regulatory structures. Thus, policy details and implementation decisions will be determined through appropriate state-level processes. It is a framework that can be updated and improved over time.

The vision leverages more than two decades of energy efficiency experience to craft its 10 implementation goals. Progress is measured across a comprehensive set of policy steps under these goals. As of the end of 2007, Vision for 2025 found much progress had been made, but more work is still needed. About half of the states have established energy efficiency programs to reach

**National Action Plan for Energy Efficiency**

- Customers, energy providers, the marketplace, and policymakers all have roles in increasing energy efficiency.
- Energy efficiency is not free, but it costs less than new energy generation and supply.
- Energy efficiency needs an appropriate policy framework.
- Measuring progress towards all cost-effective energy efficiency is important.

all customers and adopted building codes requiring a higher degree of energy efficiency in construction of new homes and buildings. Further, about one-third of the states have established energy savings targets and addressed disincentives for utility companies to support energy efficiency efforts. For example, some states have established policies so that utility companies do not have their ability to earn profits linked to selling additional energy.

Less progress has been made by states in establishing consistent, stable funding for energy efficiency. Power plants, transmission lines, and pipeline construction by utilities receive steady funding through state regulatory processes that permit the recovery of approved capital improvement costs from customer rates. States could adopt policies to also fund efficiency measures through the utility rate structure to meet the Action Plan goals.

Given the success and challenges to date, states, utilities, and other organizations are currently spending about $2 billion per year on energy efficiency programs. This level of investment has avoided energy production equivalent to more than 30 power plants generating 500 megawatts of electricity and the greenhouse gas emissions equivalent to that of 9 million vehicles per year, while saving energy customers nearly $6 billion annually.

The economic stimulus funding approved by the Congress and authorized by President Obama's signature provides a much-needed increase in resources, several times above current levels, to realize even greater benefits from energy efficiency. Even with this funding, the work of the Action Plan is not yet done. The potential for cost-effective energy savings in the nation's buildings and homes exceeds that which will be met through stimulus activities. Further, the trained and experienced energy efficiency workforce will grow under the stimulus and be ready to service the additional building stock. Policymakers can be taking action now so that the same barriers to energy efficiency originally recognized by the Action Plan continue to be removed over the long term. This will take a reexamination of how the incentives for energy efficiency investments are aligned across customers and energy suppliers, including how utilities can achieve lower costs by considering efficiency as they would electricity generation and natural gas supply in energy planning efforts. The Action Plan's Vision framework is offered to help states explore how they can continue to stimulate energy efficiency and maintain jobs over the long term.

As the economic stimulus is implemented, the Action Plan leadership will continue to make its wealth of reports, tools, and technical assistance available for states, local authorities, and energy efficiency programs. Existing best practices and expertise captured in these resources can be leveraged to help put stimulus funding to work quickly and effectively, while also supporting the development of a policy environment to support energy efficiency well after the economic stimulus funding has expired. ■

*See the Action Plan Web site at* www.epa.gov/eeactionplan.

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## Effici-Fact

A U.S. law passed in 1990 required appliance manufacturers to improve efficiency. As a result, water heaters, refrigerators, and clothes washers and dryers all use much less energy today than they did 25 years ago.

*Source: The National Energy Education Development Project*

# U.S. Efficiency Advances in 2009

*A summary of efficiency initiatives in the American Recovery and Reinvestment Act of 2009.*

The economic stimulus law enacted in February 2009 recognizes the close ties between the economy and energy production, and provides a variety of funding sources and incentives to increase efficiency and encourage broader adoption of renewable energy technologies.

In announcing his budget plan for the forthcoming year, President Obama also emphasized his commitment to greater investments in renewable technologies.

"We will invest $15 billion a year to develop technologies like wind power and solar power; advanced biofuels, clean coal, and more fuel-efficient cars and trucks built right here in America," the president said in his February 24 speech to Congress.

Highlighted below are selected new measures targeting efficiency initiatives.

- $5 billion for the Weatherization Assistance Program. This 30-year-old program pays for improvements to the homes of low-income families to increase energy efficiency. More than 5.6 million low-income families have received these services since the program began in 1976. The program increases the comfort of these homes and lowers families' energy bills for the long-term.

- $4 billion for energy efficiency retrofits in public housing units maintained by the Department of Housing and Urban Development.

- $300 million for rebates paid to consumers who purchase energy-efficient appliances.

© AP Images/The Santa Fe New Mexican, Jane Phillips

Weatherization programs, which seal structures to prevent leaks of cooled or heated air, received a significant funding boost in the U.S. economic stimulus plan. This apprentice is learning weatherization skills in a training program for "green-collar" jobs in Santa Fe, New Mexico.

- $3.2 billion in grants to states and local governments to support energy efficiency and conservation projects in government buildings.

- $4.5 billion to the U.S. General Services Administration to convert federal buildings into high-performance green buildings, combining increased efficiency techniques and renewable energy production.

- $50 million for efforts to increase the energy efficiency of information and communication technologies.

- Increased tax credits for homeowners and businesses that make efficiency improvements to their own properties.

*For more information on stimulus law measures targeting increases in renewable energy, see* http://eere.energy.gov. ■

# The Ever-Expanding Universe of Energy Star

Kathleen Hogan

© AP Images/Carolyn Kaster

American consumers check for the Energy Star label when buying home appliances.

*One of the U.S. government's flagship programs in reducing greenhouse gas emissions through energy efficiency is Energy Star®, and its name has become very familiar to U.S. consumers. If they've chosen their purchases with care since the program began, the Energy Star label might appear on products throughout the home of an average American consumer. Greater availability and purchase of more efficient goods has translated into vast energy savings and significant reductions in greenhouse gas emissions.*

*Kathleen Hogan, director of the Climate Protection Partnerships Division of the U.S. Environmental Protection Agency, has been with the agency for 20 years. Courtney Upshall, special assistant to Hogan, contributed to this article.*

By mid-morning on any given workday, millions of Americans will have gone through this routine: watched television, turned on the computer, made copies of a business document, and spoken on a cordless phone. In many households, a person might have used an Energy Star-qualified product for every one of those activities, and in doing so, saved energy, reduced the utility bill, and reduced the emission of greenhouse gases (GHGs).

The consumers who chose products that earn the Energy Star — whether for a home, a business, or a major industrial complex — saved $19 billion on their utility bills in 2008 alone, and prevented the GHG emissions from the equivalent of 29 million vehicles.

In 1992, the U.S. Environmental Protection Agency (EPA) introduced Energy Star as a voluntary labeling program, with computers and monitors designated as the first labeled products. The Energy Star label can now be found on more than 60 product categories, including major appliances, office equipment, lighting, and home electronics. For more than 10 years, the Energy Star label has also been an option for new homes and commercial and industrial buildings.

© AP Images/David Massey

Shoppers cruise the aisles at a Giant Eagle store in Ohio. The Pittsburgh-based grocery chain won a Sustained Excellence Award in 2008 from Energy Star for its commitment to protecting the environment through energy efficiency. This store was among the first supermarkets in the nation certified as a leader in environmental design.

Energy Star is a platform for retailers, utilities, and others to deliver energy-efficient products and services to customers with greater credibility and overall effectiveness. The program has engaged more than 16,000 organizations in energy efficiency, and the results have been tremendous. Consumers have chosen the Energy Star label on more than 2.5 billion products since 2000. The program is on track to more than double these benefits over the next decade.

## Why Energy Star Works

One key to Energy Star's success is its objective to overcome market barriers to the adoption of energy-efficient products and services, and a continued pursuit of that goal will allow the program to further expand its influence. In today's market, consumers have many money-saving opportunities to improve efficiency of homes, buildings, and industries. However, many consumers are reluctant to pursue these opportunities because they lack information or an understanding of their incentives — problems we call "market barriers."

By taking such steps as reducing transaction costs and lowering investment risks, Energy Star reduces these barriers so that potential energy-saving projects become more attractive to businesses and consumers. The program provides credible, objective information upon which businesses and homeowners can make better-informed decisions, directing private capital toward energy efficiency investments.

Evaluating the energy efficiency of a product or a service is another complex task. EPA has developed rigorous, industry-accepted testing procedures to evaluate efficiency specifications of products and services. When consumers purchase products or services that bear the Energy Star label, they know the goods save energy and produce fewer emissions, and that they have undergone tests to demonstrate that they perform as well as, if not better than, unlabeled items.

Other key strategies Energy Star has used to good effect include:

- New Homes: Since 1995 EPA has urged builders to aim for efficiency levels in new homes higher than that required by local building codes. By 2007, about 12 percent of new homes were built to Energy Star levels.
- Standardized Measurement of Building Energy Use: EPA developed a standardized measurement for efficiency in buildings, similar to the miles-per-gallon rating on motor vehicles. The standard is being gradually adopted with some 5,000 buildings bearing the Energy Star label, using 35 to 40 percent less energy than average.
- Whole-Home Improvement: In this decade, EPA strives to improve efficiency in the nation's existing housing stock by taking a "whole-home" approach. The program hopes to overcome market obstacles to home

improvement, allowing homeowners to achieve 20 percent energy savings per household while linking them to qualified home improvement professionals.

### Confidence in the Energy Star Brand

Now in its 17th year, the Energy Star program continues to benefit from increased interest from consumers and manufacturers both in the United States and abroad. Each year, more than 10 million visitors peruse the Energy Star Web site. Media articles that mention Energy Star reach about 1 billion readers and viewers annually.

Public awareness of the Energy Star label grew to more than 75 percent in 2008, and the trademark is also recognized worldwide.

Manufacturers and service providers are increasingly interested in working with Energy Star. The program has active licensing or partnership agreements with more than 2,000 manufacturers, 2,000 retailers, 6,000 home builders, 570 efficiency program administrators, 550 industrial companies, and hundreds more.

### Energy Star in the International Community

EPA is working with organizations in a number of countries to promote energy efficiency as a low-cost solution for addressing global climate change. International efforts are focused primarily on harmonizing test procedures and energy efficiency levels for labeling programs like Energy Star. This approach prevents development of a patchwork of standards that would require manufacturers to expend excessive resources to achieve compliance in multiple countries.

EPA has developed agreements or correspondence with agencies in foreign countries, giving them authority to implement the Energy Star program for specific product categories. The expectation is that the agencies will promote Energy Star to consumers in their markets and monitor the use of the Energy Star logo (a U.S. registered mark) to ensure it is used properly. EPA currently has agreements with the European Union, Canada, Japan, Taiwan, Switzerland, the European Free Trade Association (Norway, Iceland, and Liechtenstein ), Australia, and New Zealand.

As the program continues to develop, we hope to help further in the fight against global climate change by expanding our work with the international community.

### The Future of the Energy Star Program

As awareness of the environmental and financial benefits of energy efficiency grows, Energy Star will continue to expand. In addition to using partners' input on how to enter new, targeted sectors and markets, EPA will strive to make the adoption of energy-efficient technologies and practices even easier. Energy Star's proven results put it in the position to continue to lead the way in energy efficiency, making it simple for all of us to become Energy Stars. ■

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**Effici-Fact**

An American home equipped entirely with products bearing the Energy Star label will reduce energy bills and greenhouse gas emissions by 20 percent.

*Source: The National Energy Education Development Project*

# Blogging for Efficiency

*Utility bills and the cost of energy are popular topics for conversation among everyday American consumers. The Department of Energy's Office of Energy Efficiency and Renewable Energy recognizes that with its Energy Savers Blog, an ongoing online discussion among consumers trying to find smart ways to save energy* [http://eere.typepad.com/energysavers/ ].

*The blog prompts readers with weekly questions. The excerpts shown here came in response to two questions: "What change has made the greatest difference in the efficiency of your home?" and "What energy-saving improvements are on your 'to-do' list?"*

© AP Images/Rick Bowmer

Americans are growing increasingly aware of how home entertainment electronics can drive up their energy bills. Televisions may consume as much as 4 percent of overall household electricity.

Using a "solar clothes dryer" (also known as a "clothesline"). We cut our summer electric use by 20 percent. We still use the dryer in the winter.

Posted by: Linda | January 29, 2009 at 09:08 PM

We put new windows in our home that was built in 1972. Our bedroom is warm this winter — the first time since we bought the house in 1983.

Posted by: Cathy | January 31, 2009 at 10:06 PM

We installed a high-efficiency furnace, an Energy Star-rated chest freezer, and have replaced all of our old light bulbs with more efficient ones.

Posted by: Jason | February 02, 2009 at 04:12 PM

I put plastic on the windows and sliding glass doors on my home in Minnesota. Simple to do. Total cost was 3 hours and $40. All the drafts are gone, and the furnace only runs 2 [times] an hour (vs 5!!!) when it is ~0 deg F [-18 degrees Celsius]. Looks like the bills are about $80 cheaper vs last year based on heating degree days.

Posted by: Brian | February 09, 2009 at 03:42 PM

© AP Images/Paul Vernon

Some firms specialize in installing insulation to reduce costs for heating and cooling structures. This worker is blowing cellulose insulation into an attic in Columbus, Ohio.

We have started to use the energy-efficient light bulbs, as well as energy-efficient windows and appliances. Also we have used a programmable thermostat to turn on the heat at certain times.

Posted by: James | February 16, 2009 at 11:45 PM

I have the luxury of being able to walk to school/work/the store ... so I do. It feels good to walk in the mornings and again after a day of sitting in classes a walk feels great. Sure, it requires a few more layers when the mercury is around zero [-18 degrees Celsius] (or less!), but I just walk a little faster.

I also keep my apartment set at 64 degrees F [18 degrees Celsius] and just throw on a sweater/sweatshirt to stay comfortable. Lower fuels bills are just a bonus ... the real reward is reducing the carbon footprint I make.

Posted by: Scott | January 28, 2009 at 01:47 PM

My future plans for energy-saving improvements are to replace all the windows and exterior doors in my home that is 45 years old. In the past few years I added insulation in the attic, put an insulation blanket around the water heater, changed most of the light bulbs to compact fluorescent bulbs, and purchased a front-loading washer.

Posted by: Jim | January 29, 2009 at 12:09 PM

Gas bill was $620 last month. Out-rage-ous. Bought 12 rolls of R-30 insulation for attic. Plan to do foam in walls to seal and insulate, seal around fixed windows, and new patio doors (there are 7, yes that is right, 7) patio doors in my west wall.

Posted by: Mark | January 31, 2009 at 04:26 PM

This year I plan on putting new siding on my home. When doing this, I will put on polystyrene foam, Tyvek® [brand name of a product that is wrapped around a home under construction to provide greater protection from the elements], and insulate and caulk around the windows on the whole house. I also want to put in new outside doors.

Posted by: Rich | February 02, 2009 at 09:24 AM

© AP Images/George Widman

More urban Americans are deciding to walk to work, saving gasoline or other transportation costs and benefiting from the exercise. This attorney is walking through Philadelphia's Washington Square.

I have two main things on my to-do list: first is to replace my old dishwasher with an energy-efficient unit, and second is to insulate my basement walls. These two items have the potential to save a lot of energy.

Posted by: Andy | February 02, 2009 at 12:06 PM

I am starting to be more careful about leaving lights on when I don't need them. I am changing to compact fluorescent bulbs, and making an effort to not use as much water, by taking shorter showers and not running it while I'm washing dishes so much.

Posted by: Rachel | February 02, 2009 at 05:32 PM

I plan to unplug the appliances that are on standby when they are not being used to help reduce my energy consumption.

Posted by: Shannon | February 03, 2009 at 11:06 AM ■

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*The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.*

# An Energy Revolution by the People

Elisa Wood

*Government policies can only go so far to bring about greater energy efficiency. Real gains must be made by consumers, one at a time. Growing awareness of profligate energy use has spurred citizens to a variety of creative efficiency measures in different spheres of American life.*

*Elisa Wood is a U.S.-based writer who specializes in energy issues. Her articles are available at* www.RealEnergyWriters.com.

High prices motivate consumers to reduce energy use more than any other factor. So how do you inspire them to conserve when they are not responsible for the bill?

John Petersen, director of the environmental studies program at Oberlin College, faced this dilemma when he embarked on a project to reduce electricity use in the Ohio college's dormitories. He found the answer in a crystal ball.

Petersen set up a contest to see which student dormitories could reduce energy consumption the most. Initially, the college offered a Web site where students monitored their dorm's energy use by analyzing colorful charts and graphs. But Petersen realized the approach was "techno-geeky" and not for all students. So he designed an Energy Orb, a crystal ball-styled object that glows different colors to show building energy use at any given time. He placed the orbs in dorm lobbies. With just a quick glance, students knew their dorm was consuming a lot of energy when the ball was red, and less when it was green.

"They certainly were conversation starters," he says. "People would just gather around the orb and talk about it." Moreover, the students pursued energy efficiency in earnest; winners reduced consumption by more than 50 percent.

"Students in winning dorms did things like unplug vending machines," Petersen says. "You have students who walk by these vending machines every single day, probably multiple times a day. Before this competition, I bet you none of those students stopped to think about the parasitic consumption of electricity by this vending machine."

Students became aware "that they are walking through a world of energy-consuming devices," he says. "That's what I hope we are doing with this — making people aware of the flow of resources that are necessary to support their lives."

Courtesy of Oberlin College/ Kevin Reeves

Professor John Petersen, standing left, works with students Alex Totoiu and Adam Hull on tracking campus energy use, as recorded by the Energy Orb, bottom right.

In doing so, Petersen, an environmental scientist, cultivates a growing recognition among Americans that conservation is an act of personal responsibility. By replacing incandescent lights, caulking windows, and installing smart meters, conservation-minded Americans help stoke a $1 trillion energy efficiency boom in the United States that generates more than 8.6 million jobs, according to the American Solar Energy Society.

## In the Right Spirit

For Sara Spoonheim, energy efficiency goes beyond technical achievement; it is a spiritual act. Spoonheim is a deputy director at Faith in Place, an organization that believes two great responsibilities are common

Courtesy The Harvard Press/Lisa Aciukewicz

John Sweeney holds the device that allowed him to tap the excess energy produced by his Toyota Prius during a power outage

to all religions: to love one another and to care for creation. Based in Chicago, Illinois, the organization helps Christian, Jewish, Muslim, Hindu, Buddhist, Sikh, Zoroastrian, Baha'i, and Unitarian congregations improve their energy use.

Funded by foundation grants, religious groups, and individuals, the program seeks cost-effective efficiency for cash-strapped congregations. To that end, Spoonheim helped begin a national online store, ShopIPL.org *[http://www.shopipl.org]*, where churches can purchase discounted energy-efficient products. The store is sponsored by Interfaith Power & Light, a multistate organization affiliated with Faith in Place, which encourages religious communities to take action against global warming.

Spoonheim's latest project at Faith in Place assists Lutheran churches as they try to reduce their carbon footprint. Through a program called Cool Congregations, she helps the churches replace energy-draining appliances, install LED exit lights, and undertake other measures to cut energy use. "They have agreed to be guinea pigs, letting us experiment with them, to see what all churches will need," she says.

Places of worship offer unique challenges for energy efficiency. For one thing, a sanctuary is used typically just once a week and may contain musical instruments that cannot be exposed to extremes in temperature and humidity. Spoonheim focuses energy efficiency efforts on parts of buildings used frequently, such as homeless shelters, soup kitchens, and schools, where efficiency measures have greatest impact.

Faith in Place sees such work as primary to the more conventional efforts of religious organizations: providing food, clothing, and shelter. "Even if we do all those things, and love our brothers and sisters with our whole heart, it will not matter if we neglect the ecological conditions of our beautiful and fragile planet," says the organization.

## Car Drives House

When an ice storm knocked out power in Harvard, Massachusetts, for four days in December 2008, electrical engineer John Sweeney brought new meaning to the phrase "energy independence."

While neighbors huddled in cold houses, Sweeney and his family stayed warm because he turned his hybrid car into an emergency home generator.

Sweeney says his feat was no big deal. But then he likes to tinker with energy devices, going back to his college days in the 1970s when he drew plans for a hybrid car as his senior project.

Today, Sweeney's summer vacation spot is a sailboat with two windmills that charge large batteries to run the boat's refrigerator, lights, computer, and navigation electronics. At home, a whole-house electric meter sits on the kitchen counter. Several smaller "kill-a-watt" meters measure the power use of appliances, hour by hour. Watching the meters inspired his family to cut their energy bill by about $50 per month.

So, as heavy ice dragged down miles of electrical transmission lines in New England, Sweeney began to tinker. He realized he had a "simple and cost-effective" solution to the power outage, right outside his door.

He knew from online forums that the Toyota Prius can generate more wattage than it needs. To use the excess electricity, he needed an inverter — and happened to have one in his basement. He wired the inverter directly to the car's battery and ran a long extension cord from the car to the house. He connected the refrigerator and freezer, woodstove fan, television, and several lights.

Because the car is a hybrid, it burned 18 liters of gasoline over the four days. A conventional car, wired in a similar fashion, would use more than 150 liters of gasoline.

"This use of a car will seem normal in five to 10 years when we have plug-in hybrids and pure electric cars for sale to the general public," Sweeney says.

## Time Constraints Are No Excuse

Cathy Clites apologizes for scrubbing the kitchen floor as she is interviewed by telephone. The Louisiana

Courtesy Alliance to Save Energy

Cathy Clites, a community advocate for efficiency in Baton Rouge, Louisiana, shops for efficient light bulbs.

mother and grandmother makes the most of every moment because she is chief caretaker for her family of nine, which includes her husband, Charlie, wheelchair-bound and no longer able to support his family after a stroke six years ago.

Somehow between the cooking, the dishes, the laundry, and the shopping, Clites finds time to be an energy efficiency advocate. "It's just about being a good citizen in today's time. It is a courtesy. We are considering what will be there when our kids and our grandkids need it," she says.

She first learned about energy efficiency when she won a contest for an energy efficiency home makeover offered by NBC Universal's SCI FI Channel and the Alliance to Save Energy (ASE).

As she watched the contractors install the new appliances, lighting, and insulation, and then saw her utility bill drop, Clites was sold on energy efficiency — and decided to sell others. ASE says Clites has become "a grassroots ambassador for energy efficiency," creating a drumbeat of support. She chats up neighbors, friends, family, and church members. When the mayor of Baton Rouge declared an energy efficiency day for the city, Clites participated in a news conference to rally the city to the cause. She brings reporters through her house to view the makeover, and she takes time to design bookmarks with energy savings tips, which she distributes to anyone interested. At night, when chores are done and the house is quiet, she wanders about with an eye to stamp out "vampires" — appliances and electric gadgets no longer in use but sucking up electricity just because they are plugged into an outlet.

"In today's world we all have to look at ways of being penny pinchers. This is an easy way to do it. I wish others would try — they'd all feel like they had won something," she says.

These stories — Oberlin's orb, Faith in Place's spiritual mission, Sweeney's tinkering, and Clites's volunteerism — are just a few examples of the hard work by Americans intent on reducing energy use. Will this dedication continue? Some analysts worry that if energy prices fall, Americans will forget about efficiency. Others say price shocks have been too great in recent years for the nation to retreat. Moreover, advanced meters, Oberlin's orbs, and other measuring technologies serve as motivators.

"The electronic revolution which created personal computers and the Internet will probably also change how we generate, store, and use energy," Sweeney wrote in an article for his local paper. "Please support these changes through the political system, and encourage your kids to pursue science and engineering. This country needs to start thinking 'outside the box,' and we will need all the technical talent we can muster to solve our current energy issues in an environmentally friendly way." ■

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*The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.*

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**Effici-Fact**

U.S. Home Energy Usage

| | |
|---|---|
| Heating | 34% |
| Cooling | 11% |
| Lighting/Appliances | 34% |
| Water Heating | 13% |
| Refrigeration | 8% |

*Source: U.S. Department of Energy*

# Vampires in the House

*Many common household appliances consume energy even when they are not in use.*

Millions of Americans are paying for electricity they don't really know they're using. The electronics boom of recent decades has led to the invention of a variety of household appliances and devices that guzzle down energy just when they are plugged in, even though they are not being actively used. In fact, the Environmental Protection Agency reports that these devices cost Americans almost $10 billion a year in electricity, and they account for almost 11 percent of all U.S. energy use.

They've been called "energy vampires" because of the way they suck down energy for no productive use but only to sustain their own existence. Americans have invited them into their homes, seduced by the convenience, entertainment, and fun these gadgets introduce to their lives.

For example, a television always uses a little power so it can always receive the "on" signal from the remote control. Charging accessories also use power when not plugged into their devices but remain plugged into an outlet.

These are some of the product features that will continually consume electricity when the device is not in active use:

- Remote control
- External power supply
- Digital display, LED status light, or digital clock
- Battery charger
- Soft-touch keypad

You can check your home for energy vampires by using a power meter. Turn everything off as if you were leaving home for the day, then go look at your electric meter. If it is still spinning, you have vampires in the house. Here's how to reduce power consumption from these devices:

© AP Images/Al Behrman

Audio, video, and computer equipment can consume significant amounts of electricity even when components are not being actively used.

- Unplug products that are rarely used. In many American homes, a good example is a television and DVD player in a rarely used guest room.
- Use a power strip with a switch that controls clusters of products. The most likely targets are:
  - Computer clusters (computer, printer, scanner, speakers, wireless transmitter, etc.)
  - Entertainment clusters (television, DVD player, speakers, game consoles, etc.)
  - Audio clusters (receiver, amplifier, CD players, etc.) ■

*Adapted from U.S. Department of Energy and Environmental Protection Agency Web sites.*

# Promoting Citizenship Through Energy Efficiency

Fábio Palmigiani

Courtesy AES Eletropaulo

A view of the Paraisópolis *favela* in São Paulo. A solar panel introduces an alternate energy source to the densely populated area.

*In the developed world, electric power utilities educate customers about energy waste to boost energy efficiency. In the developing world, utilities educate customers about why it is in their own best interest to stop taking power for free and to become legitimate bill-paying customers.*

*Fábio Palmigiani is a freelance writer in Rio de Janeiro who specializes in business and energy issues.*

Brazil, the world's fifth largest country geographically, occupies nearly half of South America. With a population of 191 million, Brazil boasts one of the world's 10 largest economies, and is considered one of the most promising global emerging markets. Brazilian industries churn out products to export worldwide, and the country's electric power consumption is high.

Amidst the prosperity of a growing economy, social and class inequalities still abound. The Brazilian think tank IPEA reports that 90 percent of the world's countries have a more balanced revenue distribution than Brazil, where 75 percent of the country's wealth is in the hands of just 10 percent of the population. However, per capita income among the most underprivileged is growing between 7 and 8 percent a year, an unprecedented rate. Still, the federal statistics institute Instituto Brasileiro de Geografia e Pesquisa (IBGE) says that by 2020, the number of residents living in slums could climb to 55 million, equivalent to 25 percent of the national population.

Access to basic services like electricity in Brazil's low-income communities is limited, and slum residents in the country's southeast and northeast regions often resort

to illegal power connections to meet basic needs such as refrigeration and lighting.

The government's federal energy planning company Empresa de Pesquisa Energética (EPE) estimates that "commercial losses" — the formal term for illegal taps on electric transmission lines — average between 5 and 6 percent. However, power theft consumes as much as 25 percent of all energy produced in some regions in the northeast.

Brazilian power holding company Neoenergia owns power distributors in regions highly affected by power theft and informality.

"People don't think power theft is a crime," said Marcelo Maia de Azevedo Corrêa, the chief executive officer of Neoenergia. "Despite the support of the local government, we will only be able to eradicate this habit if the population realizes stealing power is not a smart thing to do."

Safety is a big reason that power theft isn't too smart. Haphazard connections to transmission lines and substandard equipment frequently lead to short circuits and fires.

"We had many episodes of fires in the past due to short circuits, with neighbors losing all their possessions. In some cases, people got hurt because of those problems," said Gilson Rodrigues, president of a dwellers association in Paraisópolis, the second biggest slum in São Paulo. Locally known as a *favela*, Paraisópolis has a population of about 80,000 in a metropolitan area of about 19 million.

## From Consumers to Clients

The combined concerns about power theft and safety inspired the launch of an ambitious project by São Paulo state power distributor AES Eletropaulo and the International Copper Association (ICA), in cooperation with the U.S. Agency for International Development (USAID). In 2005, the partners started a program to legalize electrical connections and reduce power theft, combined with the larger social goals of turning energy consumers into clients, promoting social inclusion and good citizenship.

"This program meant a lot for us in Paraisópolis, since power supply in our community has improved somewhat and many lives changed for the better," said Rodrigues, president of the Paraisópolis Dwellers Association.

AES Eletropaulo managed to convince customers to accept client billing by offering subsidized rates to low-income consumers. The utility company also gave customers new, energy-efficient refrigerators, solar heaters, and light bulbs.

AES Eletropaulo launched the program in response to the significant social and economic changes sweeping across Brazil.

"In Brazil, population migration is a big issue. People leave from rural neighborhoods to metropolitan areas such as São Paulo and Rio de Janeiro," said José Cavaretti, director of new projects for AES Eletropaulo. "These people cannot afford to pay the rent, so they invade public and private areas and start a new *favela*. And once a new *favela* grows exponentially, it becomes a neighborhood with big social and economic problems. With precarious living conditions, the residents cannot help but steal power from the grid."

André Urani, an economist for the Brazilian think tank IETS, believes that a vicious circle of informality in Brazil began to take its toll on the country. "We got to a point where informality and transgression came to an extreme. Those paying their power bills end up paying for consumers with overdue bills."

If allowed to continue, Urani predicts that the cycle could become detrimental to future development and infrastructure improvement in Brazil. "In this sense, it is highly questionable if a company wishing to open a new plant would choose a location with a high power bill due to informal practices [in the region]. This vicious circle must be broken somehow," Urani explained.

## Investing in Quality of Life

To turn power users into clients and to convince a low-income population that paying power bills is important, AES Eletropaulo and several Brazilian power distributors invested in improving quality of life in underprivileged communities. Power distributors Ampla in Rio de Janeiro State, Coelba in Bahia State, Celpe in Pernambuco State, and Cosern in Rio Grande do Norte State replaced a combined 30,000 old refrigerators for new, power-efficient models in *favelas*. In most cases, the old appliances were recycled and the money was donated to charity or reinvested in the community involved.

Other families were offered steep discounts and long-range payment plans for new energy-efficient refrigerators, typically one of the greatest electricity guzzlers in the home. Coelba in Bahia sells the appliance with a 60 percent discount, payable in 24 installments. To reduce electricity costs for home lighting, the power holding company Neoenergia, which owns Coelba,

Courtesy AES Eletropaulo

Courtesy AES Eletropaulo

These photos illustrate improvements in the electric wiring in Jardim Pantanal, a poor community in São Paulo State. The left photo shows the haphazard state of the electric wiring caused by illegal taps into the power lines. The later photo at right illustrates safety improvements, which also worked to legitimize power customers.

Cosern, and Celpe, donated 365,000 power-saving light bulbs.

"The main goal is to adjust energy demand in low-income communities to their domestic budget," said Marcelo Maia de Azevedo Corrêa. "The new refrigerators bring an additional benefit because we are talking about an appliance better-equipped to preserve food and improve health. The program encourages energy consumption in a sustainable way," the Neoenergia CEO said.

More than 400 communities in Bahia, Pernambuco, and Rio Grande do Norte states have already taken advantage of Neoenergia's program, which also includes upgrades in electric wiring to prevent short circuits and reduce consumption.

Asked whether low-income clients might fall delinquent in their bills again, AES Eletropaulo's Cavaretti said that permanent campaigns encourage people to keep paying their bills.

"There is no point in investing in power distribution networks if the clients start defaulting again. We are holding educational campaigns to make people aware of the importance of a steady and safe power supply," the executive said. Educational agents counsel families who are approaching delinquency in their bills.

Since 2005, AES Eletropaulo has "regularized" 275,000 residential, industrial, and commercial clients in 1,240 *favelas* in the metropolitan region of São Paulo, providing reliable, safe energy supplies to 1.1 million people, according to Cavaretti.

## Social Inclusion

The Brazilian power distributors think these programs have influence beyond improving electricity transmission, increasing efficiency, and legitimizing power customers. They enhance their own corporate social responsibility activities with a further goal of fostering citizenship and social inclusion among their clientele.

Becoming a bill-paying customer in good standing can be a passport to a new world because the utility bill provides proof of a fixed address and can lead to issuance

of a residence certificate. In Brazil, that certificate is necessary for a person to find a job, buy products on an installment plan, or secure a loan.

"This is social inclusion, by all means," Cavaretti said.

Neoenergia's Corrêa agrees. "It's not just providing refrigerators. When you come up with a social program like this, you are able to register individuals, give them a little humanity, and make them part of the society," he added.

Dwellers association president Rodrigues attests that social and educational programs on responsible energy use are popular in Paraisópolis. "It is good to have regular power supply at subsidized rates. But I guess the progress went beyond that. Once Paraisópolis residents became formal clients … they [made] a huge step away from the informal economy. And I should add that payments overdue in Paraisópolis were greatly reduced," according to Rodrigues.

AES Eletropaulo plans to replace 20,000 refrigerators in São Paulo State before the end of 2009 and is encouraging cities in developing countries in Africa and Asia to adopt similar programs. The company, ICA, and USAID will present the Paraisópolis case in Paris during the Energy Efficiency Global Forum and Exposition April 27-29, 2009.

The Brazilian government may also extend power theft prevention and energy efficiency programs, and is currently studying the sale of subsidized refrigerators throughout the country, drawing on the power distributors' expertise in the *favelas*. ■

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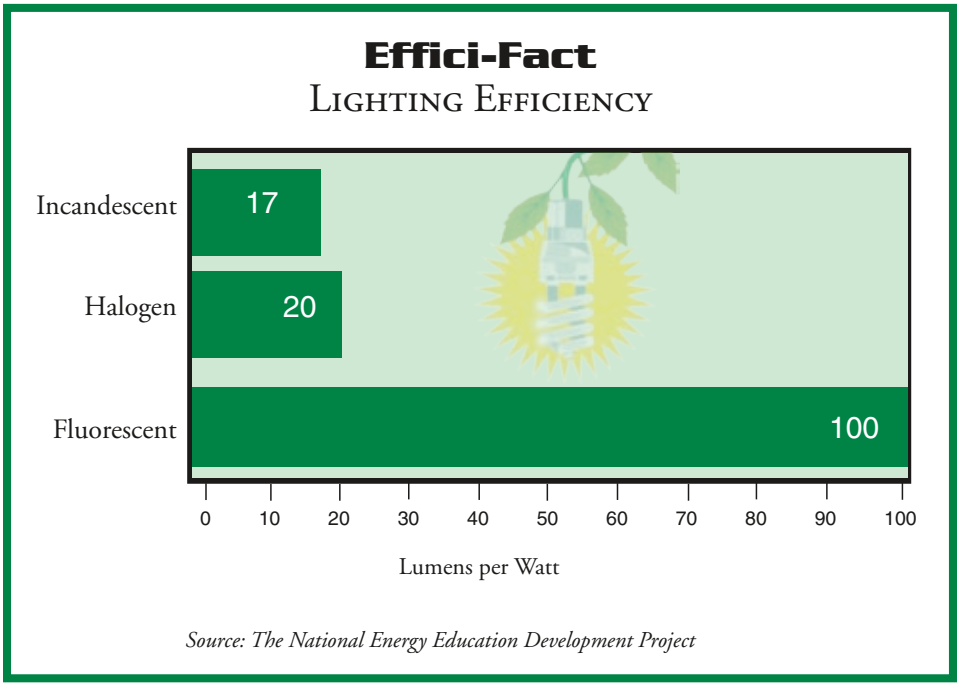

# Oil Companies Embrace Efficiency

Patrick Crow

Courtesy of Shell

This wind power generating station is co-owned by Shell WindEnergy. The 132 wind turbines located 190 kilometers west of Washington, D.C., generate up to 2364 megawatts of electricity to serve about 66,000 homes and businesses.

*Big oil companies are funding major advertising campaigns, suggesting consumers use less energy. It is not a typical approach for a company to implore us to use less of what it sells, but it underscores that all the major players in the energy economy are serious about issues of efficiency and conservation.*

*Patrick Crow covered the U.S. Congress and federal agencies for 21 years as a reporter for an oil and gas magazine. Crow now is a Houston, Texas-based freelance writer who specializes in energy, chemicals, and water topics.*

Major U.S. oil and gas corporations are in the business to sell energy, but today they are urging consumers to use less of it.

The companies are using an array of public relations tools — speeches, advertisements, advocacy groups, and grants — in campaigns to publicize the fact they favor energy efficiency. Although they have long been efficiency advocates, now they are much louder, much more fervent, and much more determined to be seen as the major ally of energy consumers in the battle against high prices.

They are not promoting deliberate conservation (when a homeowner turns the heat down and puts on a sweater), so much as they are promoting efficiency (when a homeowner installs a new furnace that burns less fuel).

Carol Werner, of the Environmental and Energy Study Institute, told *eJournal USA* in an interview that soaring crude oil prices had a lot to do with this trend. "There was a lot of outrage directed at the oil companies last year [2008] as prices skyrocketed and sent a shock through the economic system. Talking about reducing energy use was one way for the oil companies to deflect some of that anger."

Although the growth of the public outreach campaigns did seem to parallel the steady rise in crude

prices, which went from $60 per barrel in mid-2007 to a peak of $147 in mid-2008, oil prices have plunged $100 per barrel since then, but the promotions have continued unabated.

"These companies are constantly reinventing themselves and want to be involved in developing the new technologies," said Larry Goldstein, an analyst with the Energy Policy Research Foundation. He explained that the oil firms periodically update their business plans to reflect current operating circumstances. "They have to play in the world that is defined for them; they can't design that world themselves."

Werner said the oil companies also became conservation converts as they worked to reduce the expenses of operating their energy-intensive drilling rigs, pipelines, and refineries. "The more the companies can drop their consumption, the better it is for their bottom line. Plus it enables them to reduce their carbon footprint, their own greenhouse gas emissions."

The companies have taken those lessons from their own operations and formed subsidiaries to market their expertise to other firms needing to make efficiency improvements. Steven Nadel, executive director of the American Council for an Energy-Efficient Economy, explained, "They see themselves as energy companies and don't want to just ride the 'oil train'."

The outreach efforts also are an outgrowth of the industry's prior communications miscues, according to John Hofmeister, who heads Citizens for Affordable Energy. Hofmeister, who was president of Shell U.S. from 2005 until last year, said that in the 1990s and early 2000s the companies failed to educate American consumers and politicians about tighter energy supplies and subsequently have lost their trust.

Goldstein said the companies' promotions are a manifestation of their competition for market share, just like the glassware gifts they gave drivers who bought their gasoline in the 1960s. "They're all basically trying to look 'green' because they believe that's what their customers expect. It's not necessarily due to the economics of conservation but because the political and public pressures are so great. Nobody can stand up today and say 'no' to conservation and efficiency," he said.

The U.S. Congress has taken a different approach to conservation and efficiency. Earlier this year, it included in the American Recovery and Reinvestment Act an array of incentives for consumers, businesses, and governments to invest in a variety of technologies and strategies to extract greater productivity from every energy dollar.

That law may not be the final word on the subject either. Congress could revisit efficiency as it considers global warming and energy bills later this session.

For Texas oilman T. Boone Pickens, energy efficiency means using the right fuel in the right way. He has proposed that the United States use more wind and solar energy to generate electric power, reducing the need for natural gas. The surplus natural gas then could be used to displace diesel fuel use in heavy trucks, which in turn would decrease demand for imported oil. On his Internet page, Pickens said his strategy would "buy us time to develop new technologies that will ultimately replace fossil transportation fuels."

The most influential advocate for energy efficiency and alternative fuels in Washington is President Barack Obama. He has declared, "It will be the policy of my administration to reverse our dependence on foreign oil, while building a new energy economy that will create millions of jobs." ■

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## Effici-Fact

The average American uses 500 gallons (1,893 liters) of gasoline every year. The average vehicle is driven more than 12,000 miles (19,312 kilometers) per year. Improving driving habits and vehicle maintenance can achieve 10 percent fuel savings.

*Source: The National Energy Education Development Project*

# Big Oil Goes Green

*Each large U.S. oil company's position on energy efficiency reflects its distinct corporate personality, but the companies have much in common. ExxonMobil Corp., Chevron Corp., Shell Oil Co., ConocoPhillips Corp., and BP America all support efficiency and the use of alternative fuels (biofuels, solar, and wind) to different degrees.*

**ExxonMobil**, in keeping with its conservative business approach, may have been slow to fully embrace the green mantra but now is an advocate. At a congressional hearing last year, Representative Edward Markey (Democrat-Massachusetts) accused the company of resisting the development of renewable fuels during the same period that the other four companies spent $3.5 billion on solar, wind, biodiesel, and other alternatives.

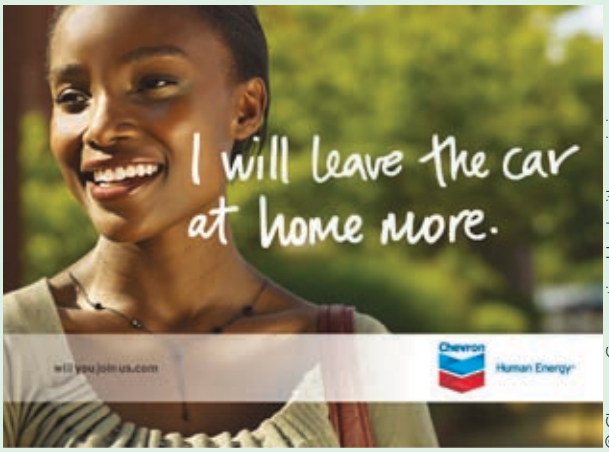
Rex Tillerson, ExxonMobil's chairman and chief executive officer, affirmed the company's commitment to energy efficiency during a 2008 talk at the World Petroleum Congress in Madrid. He observed, "Energy efficiency means using energy wisely — from employing advanced technologies to exercising common sense in using energy. It means doing the same — or more — with less."

ExxonMobil spokesman Chris Welberry said, "Efficiency is a key element in all of the advertising and outreach that we do."

**Shell** was an early proponent of alternative fuels and energy efficiency and in 2007 drafted a pro-environmental "sustainability report" that predicted supplies of easily accessible oil and natural gas probably will not meet demand after 2015. The study said, "To close the gap, the world will have no choice but to use energy more efficiently and increase its use of other sources of energy."

Jeroen van der Veer, Shell's chief executive, is guiding the company toward more ventures in alternative fuels. "It is clear that sustainable development is critical to everyone's future and to our business success," he said in a statement accompanying the report.

A spokeswoman told *eJournal USA*, "We at Shell believe we need all the solutions available to meet the energy challenge we face — including the renewable sources we have invested in, such as hydrogen, solar, wind, and biomass."




© Chevron Corporation. Used with permission.

This advertisement is one in Chevron's media campaign promoting its "Will You Join Us?" energy efficiency program.

In **Chevron**'s "Will You Join Us?" energy efficiency promotion, the company said it has cut its own consumption 27 percent since 1992. The campaign encourages consumers to cut their usage too.

Chevron's Web site explained that efficiency enhancements are the easiest, cheapest, and most reliable source of "new" energy available. "By understanding how little actions, such as unplugging a computer overnight, can produce large-scale energy savings, we believe that people will be more willing to make small changes in their daily lives," it said.

Spokesman Morgan Crinklaw said that Chevron's Will You Join Us? Internet page *[http://www.willyoujoinus.com]* has had 3.5 million visits since it was launched in July 2005. "We believe the campaign has been very successful in encouraging dialogue about energy efficiency and conservation," he told *eJournal USA*.

**BP** was the first large oil company to support limits on greenhouse gas emissions, which would

© BP p.l.c.

A transition from gasoline to hydrogen-powered vehicles depends on a network of hydrogen fueling stations. BP designed this station at the Los Angeles airport to learn how to operate such stations on a wide-scale basis in the future.

force greater energy efficiency/conservation measures throughout the economy.

In May 1997 former chief executive John Browne said that BP believed climate change was occurring and that BP would cut its own carbon dioxide emissions. At that time, the other large international oil companies all were insisting that evidence was insufficient to support the global warming theory.

BP America says it has the nation's most diverse portfolio of energy sources. It plans to spend more than $8 billion to develop alternative energy projects over the next 10 years.

In one of its public relations programs, A+ for Energy, the company offers grants for energy conservation education to schools in the United States and Canada. Teachers are encouraged to propose projects that promote energy-conscious thinking by students in kindergarten through secondary school. BP has invested more than $15 million in such projects since 2004.

**ConocoPhillips** claims to have been the first large U.S. oil firm to advocate binding limits for carbon dioxide emissions. In April 2007, Chairman and Chief Executive Jim Mulva said, "We recognize that human activity, including the burning of fossil fuels, is contributing to increased concentrations of greenhouse gases in the atmosphere that can lead to adverse changes in global climate."

Mulva's company belongs to the U.S. Climate Action Partnership, a coalition of businesses and environmental groups that is lobbying Congress for legislation. Shell and BP also are members.

ConocoPhillips sponsors an annual prize, in conjunction with the University of St. Andrews in Scotland, for sustainable solutions to environmental challenges. With Pennsylvania State University, it offers a prize for ideas to improve the way the United States develops and uses energy. ■

Courtesy ConocoPhillips/Garth Hannum

ConocoPhillips's refinery in Billings, Montana, was the nation's first to receive Energy Star recognition for superior energy performance. The refinery has also been recognized for its commitment to safety.

*— Reported by Patrick Crow*

# Additional Resources

Books, articles, Web sites, and films on energy

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## INTERNET RESOURCES

### Government

**U.S. Department of Energy (DOE)**
*http://www.energy.gov/energyefficiency/index.htm*

**Idaho National Laboratory**
Science-based, applied engineering national laboratory dedicated to meeting America's environmental, energy, nuclear technology, and national security needs.
*http://www.inl.gov*

**Lawrence Berkeley National Laboratory**
DOE-supported laboratory that conducts research across many disciplines, with key efforts in fundamental studies of the universe, quantitative biology, nanoscience, new energy systems and environmental solutions, and integrated computing.
*http://www.lbl.gov*

**National Energy Technology Laboratory**
Another institution in the DOE national laboratory system that implements research and development programs to resolve environmental, supply, and reliability constraints of producing and using fossil resources.
*http://www.netl.doe.gov/about/index.html*

**National Renewable Energy Laboratory**
Also a DOE-supported laboratory that develops renewable energy and energy-efficiency technologies and practices, and advances related science and engineering.
*http://www.nrel.gov*

**Office of Energy Efficiency and Renewable Energy**
DOE office that advances the commercialization and deployment of renewable energy and energy-efficiency technologies.
*http://www.eere.energy.gov*

**U.S. Department of State**
Bureau of Oceans and International Environmental and Scientific Affairs
State Department bureau that coordinates policies related to science, the environment, and the world's oceans.
*http://www.state.gov/g/oes*

**U.S. Environmental Protection Agency**
Energy Star
Interagency program that helps businesses and individuals to protect the environment and save energy through energy efficiency.
*http://www.energystar.gov*

### Academic, Private, and Nonprofit Organizations

**Alliance to Save Energy**
Coalition of business, government, environmental, and consumer leaders that supports energy efficiency.
*http://www.ase.org*

**American Council for an Energy-Efficient Economy (ACEEE)**
A nonprofit organization dedicated to advancing energy efficiency as a means of promoting economic prosperity and environmental protection.
*http://aceee.org*

**American Council on Renewable Energy (ACORE)**
An organization of member companies and institutions that are dedicated to moving renewable energy into the economic mainstream, ensuring the success of the renewable energy industry while helping to build a sustainable and independent energy future for the nation.
*http://www.acore.org*

**Clean Edge**
Research and publishing firm that specializes in clean-energy markets.
*http://www.cleanedge.com*

**Clean Energy Group (CEG)**
Nonprofit group that promotes greater use of clean-energy technologies through innovation in finance, technology, and policy.
*http://www.cleanegroup.org*

**Energy Voyager**
A global network of leading scientists, inventors, entrepreneurs, financiers, and senior government officials who are committed to finding effective solutions to the world's critical energy challenges.
*http://www.energyvoyager.com*

**Global Village Energy Partnership (GVEP)**
A United Kingdom charity working to reduce poverty by accelerating access to affordable and sustainable energy services.
*http://www.gvepinternational.org/*

**Recycled Energy Development (RED)**
A private venture whose mission is to profitably reduce greenhouse gas emissions by capturing and recycling waste energy.
*http://recycled-energy.com/*

**Renewable Energy Access**
An Internet source for information on renewable energy.
*http://www.renewableenergyaccess.com/rea/home*

**Rice University**
Baker Institute Energy Forum
Program dedicated to educating policy makers and the public about important energy trends.
*http://www.rice.edu/energy/index.html*

**Rocky Mountain Institute**
Nongovernmental organization that promotes market-based, integrative solutions aimed at fostering efficient and restorative use of resources.
*http://www.rmi.org*

**Stanford University**
Global Climate and Energy Project
Long-term research effort on technologies that will permit the development of global energy systems with significantly lower greenhouse gas emissions.
*http://gcep.stanford.edu*

**UN Commission on Sustainable Development**
Organization responsible for monitoring implementation of United Nations policies on environment and sustainable development.
*http://www.un.org/esa/dsd/csd/csd_csd17.shtml*

**World Alliance for Decentralized Energy**
Nongovernmental organization that promotes worldwide deployment of on-site renewable energy, cogeneration, and energy-recycling systems.
*http://www.localpower.org*

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*The U.S. Department of State assumes no responsibility for the content and availability of the resourves listed above. All internet links were active as of April 2009.*

## FILMOGRAPHY

**Abode (2009)**
Directors: James Ofsink and Justin Fernando Valls
Running time: 103 minutes
Summary: The narrator attempts his daily activities in a modern urban society in an energy-efficient way.
*http://www.imdb.com/title/tt1379047/*

**Building with Awareness: The Construction of a Hybrid Home (2005)**
Director: Ted Owens
Running time: 162 minutes
Summary: A how-to DVD on green building, featuring house design and construction with natural materials, passive solar design, rainwater cisterns, earth plasters, photovoltaics, aesthetics, and more.
*http://www.imdb.com/title/tt0456115/*

**Fuel (2008)**
Director: Joshua Tickell
Running time: 112 minutes
Summary: Record-high oil prices, global warming, and an insatiable demand for energy are issues that define our times. The film reveals connections between the auto industry, the oil industry, and the government, while exploring alternative energies such as solar, wind, and non-food-based biofuels.
*http://www.imdb.com/title/tt1294164/*

**Green: The New Red, White and Blue**
Director: David Hickman
Running time: 90 minutes
Summary: *New York Times* columnist Thomas L. Friedman looks at various green technologies being adopted by American businesses to reduce the output of greenhouse gas emissions and global warming.
*http://www.imdb.com/title/tt1024204/*

**Green Is the Color of Money**
Director: Ben Shedd
Running time: 33 minutes
Summary: Documentary about designing and building one of the world's most energy-efficient, high-performance buildings, the Banner Bank Building in Boise, Idaho. Built for standard costs using standard parts put together in an integrated way, this 11-story building demonstrates how building green can be good for business and the environment.
*http://www.imdb.com/title/tt1054598/*

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