ENERGY EFFICIENCY & RENEWABLE ENERGY:

The Missing Link in the Energy Crisis Debate

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EESI

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Home heating oil inventories are at historically low levels and crude oil prices recently reached nearly $38 a barrel. According to the U.S. Department of Energy, inventories of heating oil at the end of September were at 48.1 million barrels, down from 72.4 million barrels one year ago. In response to these figures on September 22, 2000, President Clinton released 30 million barrels of crude oil from the Strategic Petroleum Reserve (SPR) to ease tight oil supplies and reduce prices. This situation led to several hearings in the Senate and House to address energy supply concerns. In addition to tight oil supplies, natural gas inventories are also low and thus, consumer prices could increase by more than 50 percent this winter. To date, media attention has focused on alleviating the tight supplies of natural gas and oil as the way to reduce energy prices for American consumers.

The Environmental and Energy Study Institute hosted a Congressional briefing on the importance of broadening the debate to include discussion of an expanded role for renewable energy and energy efficiency technologies to reduce demand for fossil fuels. The panelists' presentations described the current energy crisis and offered several potential solutions, which included expanding the use of renewable resources, such as solar, wind, biomass, and geothermal energy, as well as developing strategies to reduce energy consumption through increased use of energy efficient technologies.

PANELISTS

Dan W. Reicher
Assistant Secretary, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy

Howard Geller
Executive Director, American Council for an Energy-Efficient Economy

David Goldstein
Senior Scientist and Co-Director, Energy Program, Natural Resources Defense Council

Scott Sklar
Executive Director, Solar Energy Industries Association

Randall Swisher
Executive Director, American Wind Energy Association

THE CURRENT PROBLEM

The panelists identified three key causes of the current United States energy crisis:

1. Declining oil production
2. Increasing consumption of oil
3. Decreasing reliability of the electricity system

Declining Oil Production

The United States currently imports more oil than it produces each day. Howard Geller, executive director of the American Council for an Energy-Efficient Economy, noted that U.S. oil production peaked in 1970 at more than 9 million barrels a day (MBD) and has steadily decreased since 1985 to our current production level of less than 6 MBD. Even drilling in the Arctic National Wildlife Refuge is unlikely to expand our production substantially. The U.S. Geological Survey's best guess on the quantity of Arctic oil is about 250,000 barrels per day, which will have little effect. In addition, drilling is an expensive, long-term undertaking, which will do nothing to ease the current price spike. "We can't produce our way out of it. It's not a shortage," said David Goldstein, energy program co-director at the Natural Resources Defense Council. "It won't matter how much we increase production," he continued. "We've got to figure out a way to lower demand so we can lower prices, and lower bills even when the price of oil can't be lowered." Goldstein argued that this crisis was foreseen years ago, and that policymakers have done some things about it ahead of time. For example, increased appliance efficiency standards and changes to building codes have lowered demand somewhat. State incentives as well as federal ones have also helped, but more policy changes are needed.

Increasing Consumption of Oil

Howard Geller argued that we need to look at the *demand* side of the energy equation and limit the growth of demand rather than increase energy supply. He pointed to the success of Corporate Average Fuel Economy (CAFE) standards following the energy crisis in the 1970s in decreasing energy consumption. Due to CAFE standards,

"We've been asleep at the wheel on vehicle fuel economy."
…..Howard Geller, Executive Director, American Council for an Energy-Efficient Economy

the average fuel economy of vehicles increased from around 15 miles per gallon (mpg) to 27-28 mpg in the mid-1980s.

Since 1985, however, the average mpg for a new vehicle has dipped about 10 percent, to about 24 mpg. This is primarily due to the increased sales of Sport Utility Vehicles (SUVs), as well as pickups and mini-vans, which together account for half of all new vehicle sales. These vehicles are classified as light trucks and consequently have a much lower CAFE requirement of 20.7 mpg. Many SUVs barely meet the existing CAFE standards, and some light trucks fall short, but penalties are limited. Due to lower vehicle efficiency, oil consumption for vehicles has increased to 10.6 MBD, 19 percent higher than the amount used daily in 1988.

In fact, U.S. gas and diesel usage accounts for 14 percent of the overall worldwide oil usage. Because current oil imports now exceed the total domestic production of oil, increased demand places upward pressure on the price of oil. U.S. consumers spend about $50 billion a year on this so-called "OPEC tax."

Geller presented a hypothetical situation: *What if we had increased fuel efficiency by* 1 *mpg for cars and* 0.5 *mpg for trucks each year since* 1987? If we had continued the trend toward greater vehicle efficiency, the United States would currently use 1.3 to 2.0 million barrels less a day, or the daily amount we need right now to relieve the pressure on worldwide oil prices. However, even though we have the technology, we have failed to improve vehicle technology. As he summed it up, "We've been asleep at the wheel on vehicle fuel economy."

Decreasing Reliability of the Electricity System

According to Scott Sklar, executive director of the Solar Energy Industries Association, a study done by the Electric Power Research Institute found that during 1996-1998, power unreliability doubled. In other words, power outages have doubled in frequency and duration. In fact, California came within a few hundred megawatts of a statewide blackout this past summer.

Sklar stated that the current threat of unreliability is related to the rules of regulation, rather than pricing issues. Uncertainty over restructuring has caused investors to not invest since the mid-1990s, and under-investment in the electricity distribution network has led to higher risk. In addition, conventional power plants have stagnated in development.

Dan Reicher, assistant secretary of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, explained that one factor contributing to the unreliability of the electricity system is that during power operation, electric plants lose approximately two-thirds of the energy used. Another contributing factor is that natural gas pipelines are at capacity, even with Canadian additions. They simply cannot meet the demand.

According to Randall Swisher, executive director of the American Wind Energy Association, the United States requires a more resilient electric industry and it needs to decrease its reliance on fossil fuels and move into the post-petroleum era. He said such changes could be made today for a limited cost because there are viable options that already exist.

RENEWABLE ENERGY RESOURCES

Within the U.S. Department of Energy, the Office of Energy Efficiency and Renewable Energy has a mission to "Lead the Nation in research, development and deployment of advanced energy efficiency and clean power technologies and practices, providing Americans with a stronger economy, healthier environment and more secure future." It hopes to link new energy efficient technologies with markets through intelligent policies.

The U.S. Department of Energy's renewable energy initiatives include:

- *Million Solar Roofs*, which aims to have 1 million solar roofs by 2010;
- *Wind Powering America*, which calls for wind energy to provide America with 5 percent of its electricity by 2020;
- *Bioenergy Initiative*, which calls for biomass to provide 9 percent of all electricity by 2010, an increase of 300 percent from current levels; and
- *GeoPowering the West*, which aims to meet 5 percent of the western United States' energy needs by 2020 with geothermal energy.

All of the panelists agreed that the most effective strategy to improve the current energy system is to reduce demand. For example, 95 percent of planned power plants are to be fueled by natural gas. Instead, Randall Swisher argued that this is "putting all our eggs in one basket. We need a more diverse portfolio." Scott Sklar agreed, noting that a portfolio of technology exists now that is "on the cusp of being truly mainstream." These new technologies that have made renewable energy resources feasible would help ease the strain on the U.S. energy system.

Solar Energy

According to Assistant Secretary Reicher, solar photovoltaic costs decreased from $1 per kilowatt-hour (kWh) in 1980 to 20 cents per kWh in 2000, and is expected to decrease further, to approximately 10 cents per kWh by 2005. Technology has advanced enough so that we can now incorporate solar technology into building materials that make up "the skin" of a building, rather than just tacking solar panels onto the roof. These "integrated building materials can help cut the costs" and are being used all over the United States. In fact, 90 utilities have active programs in solar technologies. Domestic sales of photovoltaics doubled in 1999, and in the United States, 1.2 million buildings use solar water heating. Sklar noted that if we were to put solar panels on rooftops of the ten largest "big box" retail chains (K-Mart, Target, etc.), we could power the entire United States.

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Wind Energy

The United States has the potential to generate up to 80,000 megawatts of electricity each year through wind energy. Wind is an available resource across the entire country, but it is particularly bountiful in the Great Plains region. As Reicher joked, "North Dakota is the Saudi Arabia of wind. Texas is Kuwait."

In addition to being an abundant domestic resource, wind energy is cost-effective. There is currently a price convergence between the cost of wind and that of natural gas. According to Reicher, wind energy costs have

decreased from 40 cents per kWh in 1979 to approximately 4 to 6 cents per kWh in 2000 due to increased turbine size and manufacturing improvements. By 2007, the cost should decrease further, to 2 to 4 cents per kWh.

Randall Swisher, executive director of the American Wind Energy Association, compared wind and natural gas as energy resources:

Wind	Natural Gas
low operations cost	high operations cost
high capital cost	low capital cost
non-dispatchable	dispatchable
no risk	risk
no emissions	emissions

For every dollar invested in current U.S. Department of Energy sustainable energy programs, the benefits total $200.

Ultimately, Swisher contends, adding more renewable energy to the system will moderate and reduce the cost of gas and oil because wind is free and is therefore impervious to price hikes. Almost the entire cost of wind energy is realized in the initial fixed capital costs required in building the turbines. Price stability is possible since the price of the contract is known from the start. Economies of scale can also lead to greater savings. Adding more modular units increases the overall system reliability. While wind will never provide 100 percent of the country's energy, the wind blows somewhere all the time. Swisher concluded that sustainable energy solutions make economic sense today and called for policies such as tax incentives, credits, and federal electric utility restructuring plans to include renewable energy.

Bioenergy

According to Assistant Secretary Reicher, we now have the technology to take almost any biomass – including trees, grasses, agricultural crops and residue, animal waste, and municipal solid waste – and convert it to fuels, electricity, and heat in order to replace petroleum feed stocks. Some of the potential benefits of bioenergy are new revenue streams for foresters, farmers, and other agricultural producers, as well as expanded possibilities for sustainable energy use in power production, transportation, and manufacturing processes. New plants are now being built to convert wastes into ethanol. For example, BCI Jennings' ethanol plant in Louisiana uses waste from sugar cane plantations. Major chemical companies, such as Dow and Dupont, are also looking at bioenergy as a resource.

Geothermal Energy

Geothermal energy is derived from thermal wells and hot springs below the surface of the earth. It currently costs 5 to 8 cents per kWh, down from 15 to 16 cents per kWh in 1985. Geothermal energy is an especially valuable resource in the West, where Nevada, California and Utah currently lead the country in geothermal energy production. This renewable, clean energy resource can allow the United States to diversify its energy portfolio. Like wind energy, most of the costs associated with geothermal energy are fixed capital costs to establish geothermal power plants.

Energy Efficient Technologies

In addition to diversifying our energy mix through renewable energy resources, the other half of the equation is to increase consumer use of energy efficient technologies. Improving energy efficiency is far cheaper than increasing supply. Advantages gained through energy efficiency are longer lasting as the effects compound over time, environmentally cleaner, non-depleting, and will ultimately affect supply and demand. Some areas where energy efficient technologies have been successful include distributed energy solutions, appliances, buildings, and vehicles.

Distributed Energy Solutions

Distributed energy solutions move the source of the energy closer to where it is being used. For instance, solar panels on your house can help to power your energy needs, or an industrial plant can create its own power sources, off the electrical grid. This reduces the amount of energy being wasted due to distribution and transmission from distant power plants. There are a variety of technologies that can minimize the distance between the fuel source and the user, including fuel cells, reciprocating engines, microturbines, photovoltaics, and storage.

Appliances

The U.S. Department of Energy has succeeded in updating appliance standards. In 1972, a refrigerator used 2,000 kWh per year, at a cost of $200/year. Currently, a refrigerator uses only 500 kWh per year. New standards for appliances – including refrigerators, washing machines, water heaters, air conditioners, and florescent bulbs – that go into effect as of July 2001 will save over 2000 trillion Btus of energy over the lifetime of the appliances.

The Energy Star Program, a successful collaboration between the U.S. Department of Energy and the Environmental Protection Agency, markets highly efficient appliances to consumers and designates appliances that exceed current standards.

Buildings

According to Assistant Secretary Reicher, it is now possible to build homes that are 30-40 percent more energy efficient at no extra initial cost, due to technological innovations in building material, windows and lighting. In addition, homeowners of energy efficient homes will have lifetime energy savings. In fact, *Home* magazine recently wrote a story on Reicher's house as an example of an energy efficient home. His annual energy bill is only $384, or on average is $1.05 per day. Reicher expects that once technology costs become cheap enough, we will eventually create "zero net energy buildings."

Vehicles

While we cannot retrofit existing cars with the latest fuel-efficient technology, we can make changes for the future. Howard Geller called for the following policy changes:

- *Enact tougher* CAFE *standards* by raising them 30 percent by 2006, and 60 percent by 2012 (which is about 5 percent per year, similar to what auto manufacturers did between 1970-1985).
- *Expand the gas guzzler tax*, which covers all kinds of inefficient new vehicles (defined as vehicles with gas mileage less than 22.5 mpg). To do this, Congress would have to close the "light truck loophole."
- *Provide tax incentives* to buyers of higher efficiency cars or hybrid fuel-cell vehicles.
- *Continue research and development* of the next generation of vehicles.
- *Improve labeling and education efforts* to encourage consumers to buy the best in class (similar to Energy Star appliances).

The positive effects of these changes are many, including increased gas mileage for vehicles, an average of 42 mpg by 2010 and 53 mpg by 2020. Increased fuel efficiency would result in a lower gas usage of 4.5 million barrels per day by 2020, and gas savings for consumers at the pump. Consumers will also receive the overall benefit of lower oil prices because of lower demand. Finally, better fuel efficiency leads to decreased carbon dioxide emissions. Increased gas mileage could keep more than 240 million metric tons of emissions out of the atmosphere by 2020.

THE NEXT STEPS

All of the panelists agreed that the key to resolving the energy crisis is to focus on strategies that reduce reliance on fossil fuels, such as restructuring electric utilities, educating and encouraging consumers to use energy-efficient products, offering incentives, and increasing investment in research and development.

1. Restructure Electric Utilities

According to Scott Sklar, four years ago the Administration approached the Hill and asked for a portfolio standard to ensure a mixed energy supply, which needs to include wind, solar, geothermal, and bioenergy sources. Renewable energy resources exist and are affordable, but there need to be some rules by which to play. The panelists agreed that in restructuring electric utilities, "plug and play" net metering should be allowed. In fact, in the past three years, 30 states have passed rules to allow other forms of electricity to plug into the system. The states did it because residents approached the state public utility commissions for the right to generate their own power and the right to save money.

2. Educate and Encourage Consumers to Use Energy-Efficient Products

As all of the panelists noted, technologies currently exist on the market that can help lower energy costs for consumers. Education campaigns should take place as soon as possible, because using newer, energy efficient products would immediately reduce energy demand.

3. Offer Incentives

There are currently two bills in Congress entitled, "Energy Efficient Building Incentives Act," that provide incentives, available in tax years 2001-2006, for energy efficiency improvements to new and existing buildings. One in the Senate by Senator Smith (R-NH) numbered S. 2718, and one in the House by Representatives Cunningham (R-CA) and Markey (D-MA) numbered H.R. 5345. The bills provide credits of $750 to $2,000 for houses and deductions of $2.25 per square foot for commercial buildings, as well as tax credits or deductions for purchasing qualifying residential space heating, space cooling, and water heating equipment. In addition, tax incentives for solar hot water heaters and photovoltaics were included.

4. Increase Investment in Research and Development

The panelists recommended continued research and development initiatives on the next generation of technology. Increasing federal investment in these programs will lead to increased benefits for consumers and investors. They said that for every dollar invested in current U.S. Department of Energy sustainable energy programs, the benefits total $200.

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