

Energy Update— The Sleeping Giant

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ABSTRACT

Most information on energy comes in bits and pieces, and is generally on the negative side. This article is based on a series of articles on energy in the *Wall Street Journal* and provides a comprehensive and more positive view of our energy security. It identifies renewables with the greatest potential for providing more energy independence. It discusses Brazil's successful program to become energy independent, identifies our import sources, and identifies immediate and long-range threats to our energy security.

INTRODUCTION

There is good news about our energy situation. We may have "awakened the sleeping giant," to quote the words of the Japanese admiral attacking Pearl Harbor. In a recent article in the *Wall Street Journal* by Daniel Yergin, chairman of the Cambridge Energy Research Associates, he says:

"Something big is going on throughout the energy business. It's a great bubbling of innovation in every part of the industry. This bubbling is the brew of many different ingredients—from the impact of high prices and geopolitical uncertainty to the growing focus on 'clean tech' and climate change. There has never before been so wide-ranging a drive for technological advances and breakthroughs. It affects every part of the energy industry, whether one is talking about oil and natural gas, renewable and alternatives or efficiency and demand management."

Interest in renewables surged in the 1970s after the oil embargo of 1973, but soon falling prices and availability caused a declining interest. It is now driven by market forces, technology improvements, and state and federal mandates. There is a stronger driving force. America was founded by individuals who left Europe because they were innovative, independent, and wanted an environment in which they could use their talents. This instilled an American culture that exists today and has allowed us to prevail over the many challenges that have confronted this nation since its inception. We have now taken on the challenge of energy security.

RENEWABLES

While wind power now constitutes only 1 percent of total electric generating capacity, it has the greatest potential for continued growth. Technology has advanced and costs have declined by a factor of ten. It still faces hurdles. Factors like location, wind speed, and capital costs have a big impact on the cost of generating wind power. It is, however, getting close to being competitive with the cost of generating electricity by burning coal. Present costs have dropped to as low as 3 to 4 cents per kilowatt hour. Wind power, like solar, requires storage either in the form of batteries or electric utility capacity for backup.

Solar power electrical generation still accounts for less than 1 percent of the world's power generation. Solar panels still are not very efficient at converting sunlight to electricity, and don't generate at night. Most solar electricity is made and consumed at a single site, and in many cases it does not meet the needs of a single house. Passive solar for houses, however, is very cost effective and should be investigated by anyone considering building a home.

Geothermal energy is produced by tapping heat deep in the earth. It may have more potential and least expense to society than any other alternative resource. It is produced by drilling into the ground to release steam and water that have been naturally heated. These are used to power a turbine and generator to make electricity. It is especially valuable because it makes electricity around the clock. Presently 3,000 megawatts are produced in the U.S. Mostly, it has been developed where heat is easily accessed. The biggest field in the U.S. is north of San Francisco at the geysers. Drilling technology developed by oil companies can be

used to further exploit this resource.

Biomass is the biggest source of renewable electricity in the U.S. today, producing more than wind, solar, and geothermal sources combined. Biomass is the conversion of plant matter into biofuel or electricity. Most biomass power generation is used not by electric utilities but by forest product companies like paper mills. Methane, created by decaying organic material, is a more potent greenhouse gas than carbon dioxide, so people are anxious to put it to use and keep it out of the atmosphere. Gathering and burning landfill methane gas generates a significant amount of electricity. As an interesting sideline, New Zealand, one of the most pristine countries in the world, has a population of around 13 million people and 90 million sheep. They are concerned about the methane being emitted from the sheep. No proposed solution to this one yet.

Ethanol is already by far the biggest native transportation fuel in the U.S. In this country it is made from corn. The price fluctuates with the price of corn and the natural gas used in its production. It is blended into gasoline and helps reduce bad air pollution caused by gasoline alone. There is a major problem that will limit widespread use in the country. The infrastructure is not there to provide it to all motorists. It cannot be pumped through existing gasoline lines because it absorbs water, which would cause corrosion. It must now be transported by tanker trucks.

Growth in renewables is so fast it is straining capacity in people, materials, and supplies. Materials for such items as windmill blades and silicon are in short supply.

Existing fuels, gasoline and natural gas, now have technological advances embedded in every gallon of gasoline with ultra-deep water drilling, information technologies, and future conversion of natural gas to high-quality diesel-like fuel.

Venture capitalists are now becoming involved. They will be a source of money and results-driven discipline. Many universities are engaged in research laden with energy projects, some of which have already been implemented. Others are on the cutting edge of financial feasibility. Much is sponsored by the Electrical Power Research Institute (EPRI), which is funded by electrical utilities and typically supports applied research.

BRAZIL'S PROGRAM

In 1973 there was an oil embargo by OPEC. This embargo affected all nations as price and availability impacted their economies. Brazil immediately responded to this crisis by strong government support, and continual adoption of new technologies; over a quarter of a century later, it has the cheapest ethanol production costs in the world. Ethanol is not the only explanation for their successful reduction from 80 percent oil imports to self sufficiency. They had great success from drilling in their offshore waters. By developing "flex fuel" car engines, motorists have the option of purchasing ethanol, gasoline, or a mix. Here is a country with primitive people as part of its population, and it still had the foresight to begin its path to energy independence when the first oil embargo hit.

PRESENT SOURCES OF OIL

Our imports come from almost every oil-producing country in the world. However, the major suppliers are in order of total amount: Canada, Saudi Arabia, Mexico, and Venezuela. Of the four, Canada is our best, if not our only, friend. All other sources are tenuous. Saudi Arabia is located in one of the most turbulent locations in the world, our immigrant problems with Mexico could spill over into oil imports, and Venezuela has become a socialist country. Their oil companies are now nationalized, technicians are leaving in droves, and production and efficiency are dropping.

GREATEST RESOURCE

Of all the resources now available to us, conservation and increased efficiency rank number one. It is the most cost effective, and in many cases has an immediate financial return. The greatest impediment to both is the lack of a comprehensive national educational program for citizens at all levels, from homeowners to CEOs. There are sufficient educational programs for technical people who are involved in industrial and commercial energy management, but not much for others. The Association of Energy Engineers has technical programs on all aspects of energy, which

are available in-house, online, and in classroom settings. NC State University has a three-week energy management diploma program providing comprehensive training for energy managers, and there are other less comprehensive programs providing energy training.

THREATS TO ENERGY SECURITY

There are two threats to our successfully obtaining energy independence. The first is an immediate disruption of our present oil supply lines. Iran is the country with the greatest present threat for such interruptions. A war, either declared or provoked, would bring on a series of adverse reactions. The most immediate and important would be the blockage of oil from the Middle East. At present, there are five world transit choke points that are narrow passages where transports carry oil from producing countries. Our major concern would be the Strait of Hormuz leading out the Persian Gulf where all mid-east oil must pass. It is a half mile wide, with perhaps only one half of this deep enough for transports. It could easily be blocked with mines and sunken ships.

The second longer threat is our population growth, which is expanding exponentially. Everyone requires energy for personal use and support systems such as electricity, water, sewer, schools and hospitals. And if there is a widening of the gap between the haves and the have nots as some have predicted, there will be a substantial increase in the number of low-income people who will not have the resources to use energy efficiently

DIVERSE GROUPS

There are many diverse groups working on their own agendas such as global warming, clean air and water, reduced ozone, cool towns and cities, etc. They all merge with one common objective—energy security. The awakened giant is now moving forward.

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