

Energy at a Crossroads

Timothy R. Carr, Ph.D.

Madame Chair and Members of the Committee – My name is Tim Carr. I am an emeritus scientist at the Kansas Geological Survey. Presently, I occupy the Marshall Miller Chair of Energy at West Virginia University. I serve as a consultant to the federal government, NGO's and industry. I have a business relationship with a small Kansas start-up company that is attempting to use anthropogenic CO₂ for enhanced hydrocarbon recovery in conjunction with carbon sequestration. Of the many hats, I come only to provide information and my perspective on energy in the world and Kansas.

I will read through a prepared statement that highlights my perspective on energy, and then I will attempt to bore you with a series of PowerPoint slides that will attempt to support this perspective with some information on world, US and Kansas energy.

In my opinion, we are at a crossroads in terms of energy, and, indeed, in terms of all our natural resources. Resources include not only materials and energy, but also the water we drink and the air we breathe. Providing for our world's future energy and resource needs is one of the great challenges of this century. Increasing world populations (6.5 billion now, topping out at 9 billion in 2075) justly demand higher standards of living that require more access to energy. But that is accompanied by a need for less pollution and a need to address greenhouse gas emissions, coupled with a shortage of scientific and technical personnel - more than half of the personnel in the energy and mining industries are within a decade of retirement. Without energy, our entire industrial, cultural, and health infrastructure would collapse, including agriculture, transportation, information technology, communication and many of the essentials that the public takes for granted.

Energy production must increase. Conservation in our household use and efficiency in our industrial processes and energy generation will slow that increase, but they can't stop it. Believing that worldwide energy production does not have to increase significantly in the remaining decades of the 21st century is to ignore those in the developing world who require and deserve access to energy resources.

In the United States, each person consumes about 331 million BTUs per year, the energy equivalent of 6.6 gallons of oil or 87.1 pounds of coal for every person every day. As of 2006, per capita incomes in the 30 wealthiest countries in the world are over \$33,000 per year. We number about a billion people and each year each individual consumes, on average, 217 million BTUs (or 374 barrels of oil). We represent only 17% of the world's population, but we consume 51% of the world's energy.

China, India, most of Latin America and the rest of Asia are industrializing with astonishing speed, yet their total energy consumption is only beginning to increase rapidly. The per-capita annual energy consumption of the 83% of humanity with average incomes under \$33,000 was 8.5 million BTUs per person, barely 4% of the average for the rich world. That is about 1.5 pints of oil or 2.25 pounds of coal per person per day. Numerous studies show that per capita consumption of about 100 million BTUs per year is necessary to provide barely minimal living standards in which infant mortality rates begin to decrease and approach 20 per thousand, and female life expectancies at birth begin to exceed 70 years.

If the per capita energy consumption in the developing world were increased to only 50% of that presently consumed by the citizens of industrialized nations, and if everyone in the prosperous industrialized nations were to conserve down to that same level - that is, if everyone on earth got by on only 100 million BTUs of energy per year - energy production worldwide still would have to increase by more than 40% to 650+ quadrillion BTUs of energy, compared to today's worldwide production of approximately 460 Quadrillion

BTUs. While we feel good turning off the lights or installing compact fluorescent light bulbs that will not solve the challenge of this century.

The challenge is daunting, but I believe that we will rise to it.

First, we must avoid wishful thinking and uncritical advocacy of publicly-preferred solutions. It will require deliberate action, extremely high technology, and high capital investment for many years to get where we need to go. Energy transitions are long-term, deliberate affairs.

Second, I want to stress the extraordinary scale of the effort. Installing compact fluorescent lights in every light fixture in the U.S. would meet only 4% of the nation's forecasted future energy needs. A million wind generators would address only 1/7 of our future needs and would require completely covering an area larger in size than all of West Virginia, Pennsylvania and Ohio cheek-to-jowl in wind generators. Any shift to non-fossil energies is an order of magnitude larger than was the transition from phytomass to fossil fuel in the 19th and 20th centuries. The pace of the transition will be much slower than is commonly assumed by the public and promoted in political advertisements.

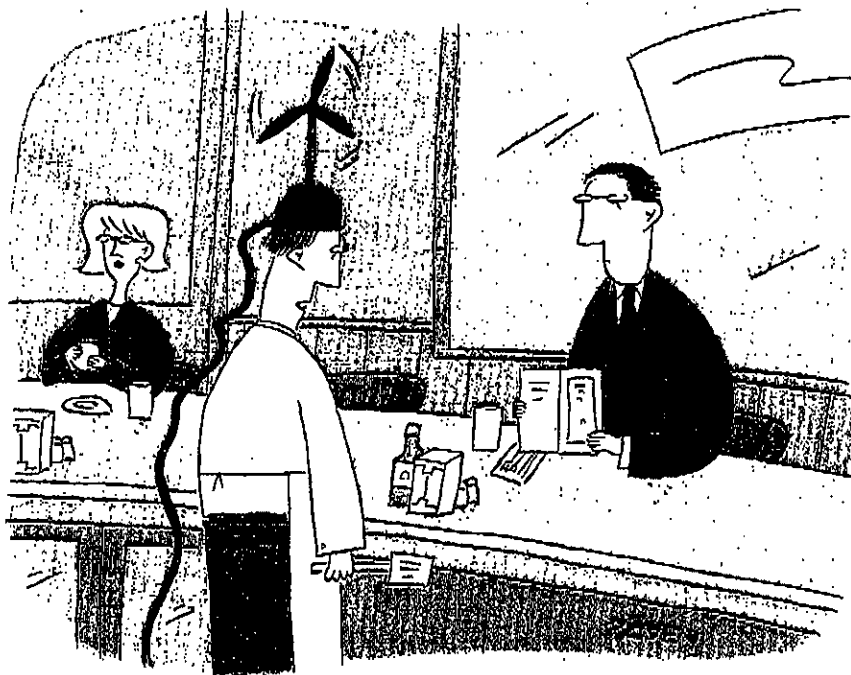
Third, every forecast from every energy agency in the U.S., Europe, or elsewhere, predicts that the vast majority of our energy will be fossil energy through 2050. It took 30 years to bring coal-bed methane and shale gas to the point of providing 15% of U.S. production, and similar time and many billions of dollars to begin developing the huge fields in 10,000 feet of water in the Gulf of Mexico, and 1.7 trillion barrels in the tar sands of Canada. We are obligated to begin to develop these future fossil and non-fossil energy resources and the infrastructure to process and to distribute that energy to light our homes, power our computers, and transport our children and grandchildren.

The palette of available energy choices is broad and must include significant research investment in all energy resources. As of this year the U.S. government is one of the very few in the developed world that does not directly support oil and gas research, the MOST critical and strategic component of our energy system.

The solution is not one-dimensional. It does not consist of simple low-tech and low-cost devices as envisioned by the true believers, biased proponents and instant energy experts. It will require dedicated work over many decades from large numbers of bright young people with strong technical backgrounds in the geosciences and engineering. We WILL have to mitigate inevitable mistakes, accidents and harm to the environment that we WILL make as part of our human activities.

CONTACT INFORMATION

Timothy R. Carr
Department of Geology & Geography
98 Beechurst Ave. PO Box 6300
Morgantown, WV 26505
Office Phone: 304.293.9660
Cell Phone: 785.550.8302
Email: tim.carr@mail.wvu.edu



*"I cook everything with an alternative energy
source, so it may take a while."*