car, or riding your bike. (If you haven't ridden it since the last oil crisis, lube the brake cables first. I learned that the hard way.) We don't use these substitutes much, yet, because they are still a bit more expensive or inconvenient than oil is. But they are still out there, waiting for us.

Here's some evidence of how painless the transition to these alternatives will be. Since it peaked about 1970, U.S. energy use per dollar of economic output has been falling steadily. It is now half what it was.

You are probably surprised to hear this— unless you are in a business that uses a lot of energy. If you are, you've worked like a dog to make this happen, and you've increased your profits along the way. But for the average person, all this has been done without much trouble or even notice by you. This is why we call the market "the invisible hand."

I don't understand why people continue to give predictions of resource exhaustion and economic collapse so much attention. The history of these predictions is simple: they have always been wrong. The theory they are built on is also simple, and also obviously wrong. But then, I don't understand why people like reading Stephen King, either. Is it possible that a nice simple story about imaginary scary things is just a fun distraction for the evening?

What scares me is that with all the attention they are devoting to oil scarcity and the coming collapse of civilization, Eugene and its politicians are getting distracted from working on the many things that markets don't reliably deliver—such as health care access, affordable housing, transportation, good paying jobs and education—and which we rely on good government to help provide. ■

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The Realities of Peak Oil—A Reply to Professor Harbaugh

BY WALTER YOUNGQUIST, PH.D.

This is in regard to your op-ed piece in *The Guard* concerning peak oil and possible oil substitutes. I was at the university for many years and for a time head of the Geology Department, but I don't believe we overlapped as some 20 years ago I returned to industry.

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My background for commenting on your article is some 50 years' involvement in various ways in the oil industry both here and abroad, including running for several years the exploration and production oil field development in Peru for a division of what is now ExxonMobil, and later work for Exxon in Venezuela and Libya. For the oil industry, as a consultant to Shell, Amoco Pan American and others, I have looked at the oil prospects in some 70 countries. One of my former students became the chief geoscientist of ExxonMobil Corporation. He is now retired and I see him frequently. Another who got a Ph.D. with me recently retired as vice president for world-wide exploration for Kerr-McGee. Through my own experience and these and other contacts I like to think I keep abreast of the world oil situation fairly well.

Also in the process of looking at worldwide oil prospects, I looked at alternative energy sources, and was a lecturer before the Brazilian National

Nuclear Energy Commission in Rio, and at the University of Bogacici in Istanbul. Later, the U.S. Department of Energy and the U.S. Geological Survey invited me to speak on alternative energy sources, and exchange views.

Peak oil and energy in general have risen to become major national and international concerns, as it should be as energy runs the modern world.

The world now uses not 20 billion barrels of oil a year, but 30 billion. Current daily use is nearly 85 million, so multiply it by 365. The peak of world oil discovery was in 1965, and it has been all downhill since. Last year in new discoveries we found about 7 billion barrels and, by drilling in and around old fields we added another 7 billion—total 14 billion, far short of the 30 billion consumed. In 2004, no major oil company and most smaller ones did *not* totally replace their production. Some went "drilling on Wall Street," such as Chevron which bought Unocal.

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Mergers indicate the industry is downsizing. Around the world more than half the oil-producing countries have passed their peak of production. In 1999, Dr. Richard Duncan and I published a paper on peak oil. We took 42 countries representing 98 percent of world oil production and came out with the year 2007. This is of course a rough estimate, but we think the peak is not far off. An independent study by Dr. A. M. Samsam Bakhtiari of the Iranian National Oil Company came up with essentially the same date, as well as did studies by the Association for the Study of Peak Oil [ASPO] (London). Bakhtiari did not cite our paper so I assumed he had not seen it and I sent him one. About 10 days later, I received a call from him in Tehran. We compared data and did not see any reason to alter our conclusions greatly. Since that time he calls me rather regularly; we update data and still believe that peak oil time is not far ahead. With world oil discovery peak in 1965 and the time it takes to put a region into full production being about 40 years, the peak would appear to be close.

There are about 600 sedimentary basins around the world. Exxon has looked at all of them. About 200 are significantly productive, and the best by far have been rather thoroughly drilled. What is left is expensive and marginal. The remaining oil will cost a lot more. Investor-owned oil companies only fully control about 6 percent of world oil reserves. The rest is largely or wholly controlled by NOCs—national oil companies. They are now in the driver's seat and they know it and make it ever more difficult with whom to do business. Cheap oil is gone.

We are now drilling more and finding less oil per foot drilled; we are not finding any more big oil fields. And more than half the world's oil comes from fields discovered before 1973. More than half of Saudi oil comes from the Ghawar field discovered in 1948. But they are now pumping in 7 million barrels of saltwater/day to keep up the pressure. It is gradually going to water. Matthew Simmons is a good friend and kindly sent me a copy of his recent book, *Twilight in the Desert: the Coming Saudi Oil Shock and the World Economy*. It is available locally. Do get it, as it presents the basic petroleum engineering facts behind the Saudi oil fields. Neither Simmons nor I believe that the prospects for increased Saudi oil production are as great as they claim. Also, the remaining oil is of lesser quality than that already produced.

In regard to substitutes for oil: There is *no* comprehensive substitute for oil in its myriad end uses, high energy density, ease of transport and handling, and in the volumes in which we now use it. Oil is much more than energy, the context in which most people think of it. There are miles and miles of roads paved with billions of tops of asphalt—the bottoms of oil refining operations for which there is absolutely no substitute. Try paving roads with hydrogen in the projected "hydrogen economy."

Biomass is now being promoted as the possible substitute for oil. This has been given a great deal of study. The problem is that the net energy recovery is low for biomass alternatives, and what is neglected is the depleting effect on soils of continuing to remove the biomass and not allowing it to return to the soil as humus, where it is the most important part of soil, retaining moisture and keeping the soil loose. Visit Africa and Haiti to see what happens when biomass continues to be removed. It is longer-term environmental suicide, along with over-pumping of groundwater.

The problem is that we are living on a great inheritance, and soon will have to live on the daily ration of alternative energy sources. Sun and wind not being dependable base loads, can only be partially integrated into the electric grid. Repeated studies in England and Denmark show that only about 20 percent of the electric grid can effectively be replaced by wind. Solar energy has numerous problems. But eventually we will have to depend on those, and some others. However, there is no way that our present population can be adequately supported on alternatives.

This brings up the other half of the energy problem usually ignored in energy studies—the matter of population and population growth. The energy problem can never be solved as long as we are shooting at a continually moving target: Population growth. Even with our huge use of nonrenewable energy sources, we do not now provide a decent living to nearly 40 percent of the world's population. But population is projected to rise to 9.3 billion by 2050 (Population Reference Bureau, 2005 world population chart). This is a disaster in the making. But rarely do energy studies mention population, and for politicians it is a forbidden topic. But population growth is the root of many, if not most, of our major problems. We have clearly overshot the sustainable carrying capacity of the planet (National Academy of Sciences study, 2003).

The foregoing is only a brief introduction to the whole matter of energy and population; they are essentially one and the same problem.

This is the century when many fundamental realities will arrive. We are currently ill-prepared for them. The future needs more attention than it has been getting. ■

Overview of Oil Production Peaks

- Oklahoma peaked in 1927 at about 700,000 BOPD; now it is 167,000 BOPD.
- The U.S. peaked in 1970 at 9.66 million BOPD; in 2004 it was 5.43 million BOPD.
- Libya peaked in 1970 at 3.32 million BOPD; in 2004 it was 1.54 million BOPD.
- Kuwait peaked in 1972 at 3.28 million BOPD; in 2004 it was 2.34 million BOPD.
- Iran peaked in 1974 at 6.03 million BOPD; in 2004 it was 3.93 million BOPD.
- Saudi Arabia peaked in 1981 at 9.64 million BOPD; in 2004 it was 8.86 million BOPD.
- Russia peaked in 1983 at about 11.5 million BOPD; in 2004 it was 8.88 million BOPD.
- Alaska peaked in 1988 at 2.14 million BOPD; now it is 968,000 BOPD.

Source: www.gregcroft.com/peakoil.ivnu