ABUNDANCE

We constantly hear that our present way of life is unsustainable because the world is running out of fossil fuels and other vital resources. But if we look at what the technological revolutions have brought over the centuries we have to question the conventional concept of sustainability. History tells us that technological innovation is the key to sustainability. For instance the steam engine spawned the Industrial Revolution and spawned the transformation that we have seen in the last 200 years. The internal combustion engine and the motor car freed us from inadequate, expensive and polluting horsepower.

People in developed countries are healthier and live longer than in the past. Abundant energy, engineering, technology and modern medicine have driven this transformation. We have progressed from eking out a living from subsistence agriculture to having plenty of time for recreation and relaxation and living better than a king of 300 years ago.

Nevertheless, billions of people are still living in poverty, and they (and us) need good governance and economic growth from using the best available technology to ensure that goods are supplied at the lowest cost and that energy is used efficiently and wisely. This is what engineers do. The best definition of an engineer is, "Someone who can do for 25 cents what any fool can do for a dollar". Another is, "The art of directing the great forces of power in nature for the use and convenience of man." [1]

Energy and technology bring prosperity and only prosperous economies can afford to look after the environment. So to claim that "economic growth is incompatible with the environment" is the exact reverse of the truth.

Despite what we are told, the world has more resources available to it than ever before. When the steam engine was first invented, people were worried that, quite soon, the world would run out of coal. Now the world is known to have more coal than it is ever likely to use. Modern coal-fired power stations are clean and efficient. With modern technology, coal can be burned directly in gas turbines and diesel engines while the ash is converted into valuable by-products. We have enough coal for hundreds of years. And we don't even have to mine it: underground gasification can turn coal directly into gas without the dangers associated with mining.

Two or three years ago, the United States and the United Kingdom were expecting to import more and more gas. The shale gas revolution has turned this around. For the last hundred years, the reserves of oil have steadily increased. For the same 100 years people have been predicting the imminent arrival of

"peak oil". They have been wrong every time. Reserves are now 25 per cent greater than they were 10 years ago[2]. Even if oil did start to run out, the immense gas reserves in offshore "methane ice" (clathrates) could easily be turned into liquid fuels.

According to Rogner[3], by 1994 the world had used 291 Giga tonnes oil equivalent (Gtoe) of fossil fuels and the resource base was 3,400 Gtoe. If clathrates are included then the resource increases by an amazing 19,000 Gtoe.

What about dangerous man-made global warming? The evidence tells us that the world has not warmed significantly in the last 10 to 15 years. This proves that man-made CO_2 does not cause dangerous global warming. The world is now heading for a period with low or zero sunspot numbers. The last time this happened, we had the Little Ice Age. The big risk is cooling that will increase our need for ample supplies of low cost energy and, if history repeats itself, will bring famine and disease.

For electricity, nuclear power and, in particular, reactors burning thorium, promise us a virtually unlimited supply of electricity at a reasonable price. And for those that believe it is too dangerous to contemplate, recent research into radiation shows that exposure to low levels of radiation is not harmful and may even give some immunity to cancer. The radiation limits for nuclear power stations could be raised by a factor of 200 without the slightest risk[4]. Doing this would reduce the cost and change the public perception of the dangers of nuclear power.

It is now clear that nobody will die from radiation from Fukushima. Nobody. The highest levels of radiation experienced by the workers at the station are well below levels that are actually dangerous. But people did die of heatstroke because of power shortages resulting from shutting down undamaged nuclear stations[5].

If human ingenuity is allowed to follow its natural course, new and improved technologies will continue to provide us and future generations with affordable, reliable energy. Well before fossil fuel reserves come close to being exhausted, we will have found better ways to generate power, perhaps in ways which we cannot yet conceive. Humankind's progress has been sustained via a series of unexpected, disruptive developments in technology and knowledge.

In spite of all the predictions, the world is not running out of food. With the efficient use of irrigation, improved plants and reduction in the enormous wastage that occurs in developing countries, the world could easily feed a much larger population. As population growth declines sharply as people become more prosperous, economic growth in developing countries will go a long way towards solving the population problem.

I believe that one of the biggest dangers facing the world is well-meaning people who believe that the world is running out of resources, that technology has nothing good to offer, that it will no longer continue to make our lives better and better and that economic growth is incompatible with the environment. If these people carry the day, our grandchildren will suffer.

We can choose to use the world's ample energy resources wisely and prosper. Or we can shun them and doom ourselves to a continuing decline in living standards and the developing world to continued poverty, overpopulation, disease and famine. The choice is ours.

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1 *Tredgold 1828*

2 *http://www.bp.com/sectiongenericarticle800.do?categoryId=9037161&contentId=7068605*

3 *www.scribd.com/doc/54116697/An-Assessment-of-World-Hydrocarbon-Resources-Rogner*

4 *www.radiationandreason.com*

5 *http://mobile.bloomberg.com/news/2011-07-12/heatstroke-deaths-quadruple-as-japan-shuns-ac?category=*

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