

JOHN HOWE'S PLAN TO CONSERVE FOSSIL FUELS WHILE WE DESIGN AND BUILD A SUSTAINABLE FUTURE WITH RENEWABLE ENERGY SOURCES

John Howe is a retired engineer living in Maine, USA. He is the president of a company, Howe Engineering Co which has manufactured bicycle powered generators commercially. He has recently built and is testing an example of a 13 hp solar powered tractor to do all familiar agricultural functions as well as suffice for limited transport up to 20mph (32km per hour) See figure below.

He has just published a book, *The End of Fossil Energy*, which is recommended reading in the May 2004 Newsletter for ASPO, The Association for the Study of Peak Oil¹.

John Howe says that everyone should be acquainted with the story of energy. He says, and DSP agrees, that time is critical so that there is "not a moment to lose²."

He is the only scientifically trained author of whom DSP has knowledge so far, who has attempted to calculate concrete details of how much fossil fuel energy we can, and should reasonably conserve, and for how long we can stretch out this energy supply. In this calculation, to fill the energy gap, we must estimate how much renewable energy we must create to mix with the conserved fossil energy. It is, of course of the greatest importance that we stretch out the conservation of the fossil fuels as long as possible. Howe believes that, with good management, we can, and should, conserve and stretch out the remaining fossil fuels for another 150 years. Such conservation is vital to allow nations to make the huge adjustment to renewable energy, but especially to provide adequate energy for research into such sources as nuclear *fusion* energy and the hydrogen/fuel cell concept.

Howe is most impressive in his arguments that we must calculate actual numbers in such planning.

John Howe says he agrees with the two major oil companies, Royal Dutch Shell and BP, that the original endowment of Earth was of the order of two thousand billion barrels (i.e. two trillion) of conventional oil. There is further agreement that the oil remaining is now only around half of the original endowment, i.e. around one thousand billion barrels. The rate of depletion has been accelerating rapidly so that most of the depletion has occurred in the last 25 years. Further, an agency of the government of the United States, the Energy Information Agency (EIA) believes that today's rate of depletion will accelerate. Howe says that if the EIA's calculated increased rate of consumption occurs, the oil could be 80 per cent depleted in 2025, a mere 21 years from today.^{Hp33}

In his estimation of numbers required, John Howe uses the following methodology:

1)

Start with total world energy consumption in all forms, fossil fuels, nuclear and renewable.

2)

Convert all energy forms to equivalent barrels of oil. Because of the huge quantities involved, the common term used will be "equivalent billion barrels of oil" (EBBO). If electrical output is the quantitative value of energy such as from hydro, solar, a wind farm or nuclear plant, the electrical output in kilowatts will be divided by an efficiency factor of 35 % (0.35). This equals the EBBO that would be required to produce the same amount of electricity in a conventional plant.^{Hp30}

Natural gas reserves are difficult to quantify, especially in less friendly countries, but they appear to be similar to, or little better than for petroleum. World reserves are presently estimated at 155 trillion cubic meters, or an equivalent of 884 EBBO. World gas consumption rate is 14 EBBO per year; therefore we would appear to have a 63-year reserve (884 EBBO divided by 63 years), but this time period will be considerably reduced as consumption is increased.^{Hp34}

(For his analysis, Howe intentionally de-emphasizes the remaining coal and non-conventional types of oil in the form of shale oil and tar sand, equal to hundreds of billions of barrels of oil, but they require huge amounts of energy to process, and cause considerable environmental problems both in extraction and in refining...He believes, "if we don't count them in our pocket now, we will have more incentive to start immediately to make the necessary reductions in oil and natural gas)".^{Hp31}

The Department of Energy (DOE) agency of the United States Government has published statistics showing the contribution of each energy source in the world and in the United States for 2001 as depicted in the following table:-

	<i>WORLD</i>		<i>USA</i>	
OIL	39%	24.88 EBBO	39%	6.05 EBBO
NATURAL GAS	23%	14.8	24%	3.69
COAL	24%	15.25	23%	3.55
HYDROELECTRIC	6.7%	4.27	3%	.050
				(0.62 in 1996)
NUCLEAR	6.6%	4.21	8%	1.20
ALL OTHER FORMS	<1%	0.49	3%	0.55
TOTAL IN 2001	64 EBBO		15.5 EBBO (in 2001)	
			16.0 (est in 2003)	

Thus, we can see the contribution of each energy source in the world. (A close examination of the table shows some inconsistencies depending on which EIA source is used.)

These statistics show that "together, the big three: oil, coal and natural gas provide 86 per cent of the world's energy." A vital point is that oil, with a 39 per cent share of total energy, is the primary fossil fuel source being depleted today.

"Unless we act quickly, there will be a collapse of our present energy intensive civilization, and without the energy of fossil fuels there is no possibility for a renaissance of such an energy intensive civilization as we have now."^{Hp44}

"With the [much smaller] energy available from these non-fossil fuel sources, it is paramount for survival that we design a *new, low-energy lifestyle*." Thus we must plan on how to get to this new state with the remaining fossil energy we have left "in the bank" before it is frivolously used. In other words, we must not presume that we will discover a significant breakthrough such as *fusion energy*.

Howe's vision includes:-

1. Continue using centralized generating systems (power stations) and electricity

grids which we have now.

2. Start building decentralized solar energy systems (both electrical and heating) in all new and existing homes. In this way, each home becomes an independent power plant. We have the technology now; our ancestors did not.
3. Drastically downscale all travel and movement of goods with the ultimate goal of electric mass transportation. Small electric vehicles will provide for individual needs. It's either that, ride the bike, walk, or stay home.
4. Save precious fossil fuel for agricultural, military, municipal fuel, important mass transportation, and other energy uses. If we start immediately to conserve these fuels, we might buy enough time to invent new high-energy sources while we still have the infrastructure of a functioning society. We should save enough fossil energy to ration over 150 years.^{Hp59-70}
5. *Our remaining finite supply of fossil fuels must also be available to make the transition to sustainability. This makes possible the infrastructure we need to make solar cells, windmill blades, and continued research and development of new energy sources.*

There are 3 basic parts in the proposed future

1. The Private Residence (PR) as noted above. This energy source will be able to supply most of the energy for both the dwelling and a personal transportation vehicle (PTV) or multi-purpose electric utility vehicle (EUV), for hot water heating, hot showers (brief), two small cooking burners, one well-insulated oven, TV, computer, communications, washing machine, lighting, water pump, miscellaneous power tools and efficiency losses, toaster and vacuum cleaner. Howe proposes all 40 million American homes would be so equipped. The actual living area for the cold months in the colder portion of the nation would be reduced to a warm core part of the home. Home food production will have to become a way of life. All of the home heating and most of the hot water would have to come from active or passive (thermal, not photo-voltaic) solar heating, well-established today throughout the world. Thus the total from 40 million homes would be 0.6 EBBO annually, (0.3 photovoltaic and 0.3 thermal)
2. CENTRALISED POWER STATIONS: - The purpose of these power stations is to mix all energy inputs and outputs for a surrounding region and smooth demand and supply so net energy flow is neutral. All power stations would include large-scale photovoltaic production totaling 0.3 EBBO in the United States. As well all power stations would be supplied by wind farms, producing 0.3 EBBO nationally. This would equal the total residential output of 0.6 EBBO, bringing the total electricity produced by renewable energy to 1.2 EBBO by 2050.
3. The PERSONAL TRANSPORTATION VEHICLE (PTV) AND THE ELECTRIC UTILITY VEHICLE (EUV)

Retired engineer John Howe is getting acquainted with his 13 horse power solar powered *Farmall Cub*. So far he has learned 1) It works 2) It doesn't need gasoline, 3) It doesn't need 2000pounds of hay and grain each year like a team of horses or oxen. 4) It doesn't pollute the air. 5) It loves sunshine.



“Automobiles and airplanes are the highly visible symbols of the fossil energy age. Only liquid hydrocarbon fuels can provide the necessary high energy to low weight and volume ratios required for rapid personal movement.”^{Hp52}

We will have to stop moving ourselves and use our new communication technologies for conveyance of messages

and visual images. Shipment of goods will also have to be reduced to an absolute minimum... There have been many attempts to market electric personal vehicles, but commercial success so far has been limited because of overwhelming competition from fossil fuels (see www.zapworld.com). Water travel will have to go back to sail power possibly augmented by solar electricity...

In the long term, large scale commercial farming will eventually have to revert to a percentage use of oxen, horses and mules, because the manure (also called "black gold" at one time) is essential to maintain soil productivity... Eventually, population will have to significantly decline and revert back to many small farms.^{Hp56}

In the final fossil-free civilization, in the absence of an energy subsidy from a technology such as *fusion* energy or success with the hydrogen-fuel cell combination, all energy will have to come from concurrent solar radiation. This must even include the energy to reproduce the hardware necessary for long-term sustainability. The head start we have now, due to the carry over of remaining fossil energy, will eventually be used up... they will have to rely on incoming solar power to manufacture new solar cells, batteries, copper wire, structural steel, aluminum, and on and on.^{Hp56}

The challenge may seem overwhelming and barely conceivable, but it can be done in theory. For instance, a photo-voltaic solar system that could last 50 years requires only one or two years of returned energy for replacement....

Obviously this type of energy usage and capital investment would be done at centralised facilities... Also, transportation and the energy for ore extraction will have to be provided by centralized solar and hydro using batteries or hydrogen for storage.

"It could be argued that it is impossible for an advanced civilization to exist anywhere in the universe for longer than a few thousand years. The very unique circumstances required to concentrate metals and energy on a singular planet cannot provide enough resources to last longer than a few years in the years in the cosmological time frame."

"This is not a unique concept (see *The Olduvai Theory: Sliding towards a Post-Industrial Stone Age- Richard Duncan*¹⁵) and the websites www.communitysolution.org or www.postcarbon.org

THE FIVE PER CENT PLAN: - DSP believes his five per cent plan (five per cent reduction each year in usage of fossil fuels) or something like it, is vital for the preservation of civilization for us, our children and grandchildren. Howe is quite naturally sad and concerned that his nation of some 270 million people are viewed as the "bad guys" of the world, because their 5 per cent of the world population is using up 25 per cent of the world's fossil fuels on an annual basis. His 5 per cent plan gives details of EBBO's of fossil fuels that would be saved, item by item, year by year, e .g. initially giving up their large cars and trucks, switching to 35 miles per gallon cars, reducing travel etc. so that the 16 EBBO used in the year 2003 will be reduced to 5.85 EBBO by the year 2040.^{Hp59-70}

Howe does not estimate such detailed plans for any other nation, but this type of plan would seem the only way for all the nations of the world to go, very likely supervised by an agency appointed by the United Nations.

IN SUMMARY: Engineer John Howe's concrete proposals of how the nations of the world could reduce their dependency on the finite resources of fossil energy is thought by DSP to be an excellent concept that we (and the world) could adopt. The adjustment by the United States will be especially difficult

because that nation has been so profligate in its consumption of fossil energy. It will be a huge blow to the functioning of that country's economy. However, great difficulty will be experienced by all nations, not least Australia because its great distances, and the dependency of Australia's economy on agriculture and mining. All three, travel, agriculture and mining are highly dependent on fossil energy, and the Australian economy will suffer greatly.

However, the sooner the Australian Government and *all the world's governments face up to the fossil energy depletion, the less suffering there will be by all the world's humans.*

1. **Campbell, Colin, *Association for the Study of Peak Oil*** May 2004. The ASPO Newsletter is now available at: <http://216.187.75.220newsletter44.pdf> and <http://www.peakoil.net/Newsletter/NL41/newsletter41.pdf> or www.peakoil.net
2. **Howe, John *The End of Fossil Energy***, McIntire Publishing, 2004.com/book, 2004. (John Howe is moving quickly towards a second printing with updates, corrections, and a new layflat cover)