THE NEW CITIZEN Extra

Official Publication of the Federally Registered Political Party
Citizens Electoral Council of Australia

For More Information:
CONTACT US
1-800-636-432
PO Box 376
Coburg Vlc 3058
Web:www.cecaust.com.au
Email:cec@cecaust.com.au

March/April 2006 $2.00 (inc GST) Print Post: 30601/00002

World Teeters on Brink of Financial Crash

March 18—A panic is setting in among key financial circles—a panic that we are fast approaching the final disintegration of the financial casino known as the global monetary system. Reflecting this panic, as well as intensifying it, a series of shocks hit world markets in February and the first half of March:

* A financial crash in the tiny nation of Iceland on February 21 set off shock waves in the currency and bond markets in Australia, New Zealand, Brazil, Mexico, Indonesia, Turkey, South Africa and Eastern Europe. Iceland's currency, the krona, fell 9.2% against the U.S. dollar; its stock exchange collapsed by 5.2%; the nation's interest rates shot up to 10.75%; and its largest bank had to issue a statement claiming that it was solvent —a sure sign that it isn't.

* A second round of panic broke out on March 7, when stock markets in Russia, Turkey and all over Latin America plunged by 3-6%, causing risk premiums on those nations' bonds to shoot up, and some of their currencies to plunge, as in Brazil, Turkey and South Africa, in particular. Commodity markets also saw panic selling, particularly in such base metals as copper, zinc and aluminium.

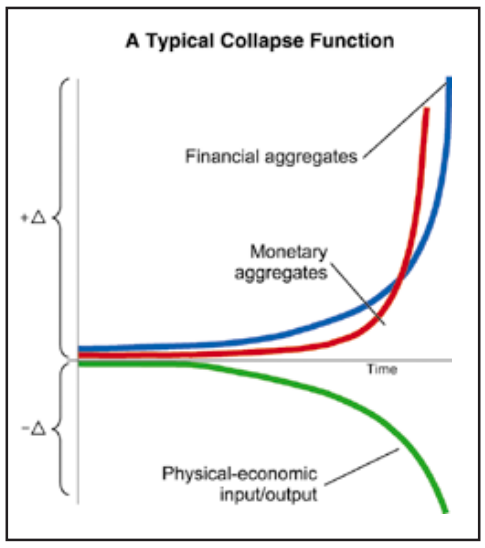
* A week later, a new round of panic swept world markets, in particular in the Middle East, where the stock market of Dubai plunged by 12% on March 14 alone; Egypt's collapsed by 11% in one day until the government intervened to prop it up; and Kuwait and Saudi Arabia's markets continued to collapse, the former losing 17% since February 7, and the latter an astounding 28% since February 25.

* The U.S. on March 16 announced a staggering US$800 billion annual current account deficit—a clearly unsustainable sum which portends a crash in the dollar.

The Yen Carry Trade

As dramatic as some of these events are, "you ain't seen nothin' yet". At the end of February, the Bank of Japan announced that it intended to end one of the chief props of the global financial bubble over the last decade, the "yen carry trade". London's *Daily Telegraph* of February 25 explained how the yen carry trade works: "The 'carry trade'—as it is known—is a near limitless cash machine for banks and hedge funds. They can borrow at near zero interest rates in Japan, or 1% in Switzerland, to re-lend anywhere in the world that offers higher yields…" And, the paper continued, "The carry trade has pervaded every single instrument imaginable, credit spreads, bond spreads; everything is poisoned. It's going to come to an end later this year and it's going to be ugly…"

When Japan raises its rates, borrowers in yen will have to "unwind" their positions in commodities, stocks and bonds, real estate, and other speculation, which will become unprofitable using borrowed yen at higher interest rates. This will set off a global wave of selling as everyone stampedes for the doors, so as not to be left holding the bag as asset prices plummet. Under enormous pressure from many central banks, the Bank of Japan has temporarily put off raising its rates, but over the next few months will do what amounts to the same thing: it announced on March 9 that it will cut back by 80% the amount of funds it lends for free, down from approximately US$300 billion to only $50 billion.



LaRouche's "Triple Curve". It depicts how the financiers loot the real physical economy (bottom curve), in favour of Financial Aggregates (stocks, bonds, derivatives, etc.). Monetary Aggregates (money supply) must be issued so that ever-increasing Financial Aggregates can be turned over (bought and sold); when the former curve crosses the latter, a hyperinflationary volcano is unleashed, as in Germany 1923, or at present.

The Synarchy's Clash of Civilisations

Faced with the near-term collapse of its globalist system, the London-centred international financial cartel (the Synarchy, pron. Sin'-arkee) aims to unleash chaos worldwide so as to prevent sovereign nation states from collaborating to reorganise (i.e. eliminate) the disastrous, tyrannical system of globalisation. This is the cause of the mad drive by the British to unleash a war against Iran, using its well-known influence over the Dick Cheney-run U.S. White House. From a U.S. national standpoint, why in the world would Cheney and his neocon buddies be screaming for a U.S. (or Israeli) strike

Continued Page 2

LaRouche: A Vision for the Next Fifty Years

Physical economist Lyndon H. LaRouche gave an international webcast on February 23, 2006, in which he outlined the urgent tasks for mankind over the coming two generations. In a nuclear-armed world of over six billion people, he explained, war must become a thing of the past if civilization is to survive. A new era based upon the collaboration of sovereign nation states must supercede the present Synarchist-run Hobbesian world of perpetual conflict, thus ushering in a new age for mankind and even for the Biosphere itself. The following are excerpts from his speech, which he directed in particular to the large number of young adults in his audience —who have the next fifty years of their lives still in front of them.

Now, what're we going to have to do? Take the programmatic issues. We're going to have to have an immediate return to nuclear energy, as a basic cornerstone of economic policy. If we don't go to nuclear energy, we're not going to have civilization. It's that simple. You want to die? Take nuclear energy: Think nuclear energy's dangerous? All right, but you'll die without it. So, you better get it. And control it, of course, when you get it.

Because, in what we have to do, we are in a new period in all of humanity. There's *no* period of humanity like it, in this one respect: The population of this planet is well over six billion people. If we provide a modern standard of production and life for the typical person, among this six billion people, we are going to find out that we are going to be using up what are called "natural resources" more rapidly than they are replenished.

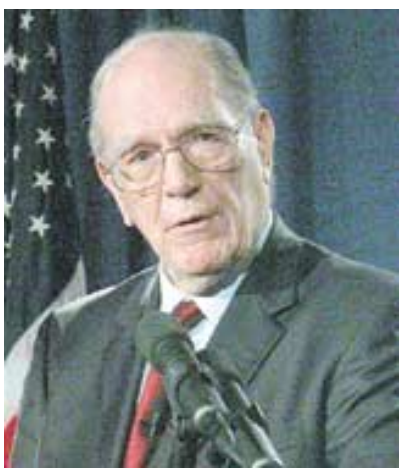
Creating "Natural Resources"

So, no longer can we come along, like Robinson Crusoe on an island, and prey upon the natural resources we find there for our use. Now, we're going to have to start to *reproduce* what we consider "natural resources." We're going to have to move in on the Biosphere of this planet … and the Biosphere goes from the crust of the Earth, up to the top of the atmosphere, because the atmosphere was created by living processes. The oceans were created by living processes.

You find we have a terrible shortage of water. Many parts of the world are living on fossil water. For example, at one time, in Eurasia, you had great glaciation. The glaciers melted. And in the process, you had a deposit of fossil water, some of it *millions of years old*, as in some parts of India, at some depth—fossil water. Now, people say, "Okay, we've got water! We'll dig for it! We'll drill for it!" What're you drilling for? You're drilling, not for replenishable water; you're drilling for fossil water….

This is not an inexhaustible resource. It's not an automatically replenishable source. And about 40% of the human population is depending upon fossil water.

Similarly, we depend upon mineral deposits which were



Lyndon H. LaRouche, Jr.

left by dead animals and dead plants, millions of years ago. We call those "ores." But, the elements which are in that ore were not concentrated in that way, that we find them, when we mine for them, today. Animals, selectively, took certain things out of the ambient environment. Some use more iron, some use more of something else. These animals or plants died: And their little dead bodies left the skeletons behind. The skeletons contained these minerals, in certain forms. We dig, where these animals died, or where they were concentrated in dying—as in seas, or things like that that dried out; we dig down there, we find this stuff, and we take it away. Now, we find that rich ores, where the concentration of the metal is greater, are fewer, and fewer, and fewer. So, now, what're we going to have to do? We're going to have to start organizing the planet, to replenish—directly or indirectly—the kinds of

Continued Page 2

Solve Australia's Water Crisis - Prof. Lance Endersbee Page 3

Continued from Page 1

against Iran to "stop its nuclear weapons program", when official U.S. intelligence estimates state that Iran could not acquire nuclear weapons in less than 10 years, even if it intended to? And why scream for a strike now, when the Russians and Iran are close to a deal for Russian supervision of Iranian reprocessing of uranium, which would make a weapons program impossible?

American statesman Lyndon H. LaRouche addressed a seminar of German political leaders in Berlin on March 6 on the effects of a U.S. or Israeli strike against Iran: "If this happened, what it would do, is set off a chain-reaction in the world", not only in petroleum, whose price would zoom to US$150 per barrel overnight, but it would unleash a re-run of the medieval Crusades, "to make Islam the target … to have perpetual warfare, and perpetual régime-change of that type, going on in the world. To take a billion people in Islam, and declare them an enemy and open up what we call 'irregular warfare' or 'asymmetric warfare' throughout the world, among religious bodies, using the Islamic issue as the primary cause. This would be, under those conditions, the end of civilization as we have known it."

Tony Blair, Warmonger

The Way Out

Instead of perpetual war/perpetual revolution genocide under the British/Cheney scheme, the world needs a system of sovereign nation states—a New Bretton Woods system—which takes back control of the world's economy from the private financiers who have increasingly destroyed it since they forced U.S. President Nixon to take the U.S. dollar off gold in 1971, which ushered in "globalisation". As LaRouche explains elsewhere in this issue, mankind faces great challenges over the coming decades in creating the vast amounts of raw materials the human race needs to survive, among other pressing tasks, including dealing with a bird flu epidemic which could well kill tens of millions worldwide under the present lack of global preparedness.

As for the collapse of the globalist system, upon being briefed on its expected blow-out with the end of the yen carry trade, LaRouche, the world's leading economist, commented, "Let it happen. The system is doomed under any circumstances, and we know what must be done to create a new, stable financial system, based on the principles of Franklin Roosevelt's Bretton Woods System. I am ready with a recipe for precisely how to solve this crisis. Are you?"

LaRouche: A Vision for the Next Fifty Years

Continued from Page 1

things we have been content to use up and exhaust as ores, beforehand….

A High-energy-density Economy

So, we're going to have to, at this point, go to a high-energy-density economy: Which means, very capital-intensive. This means that we're going to have to have a lot of nuclear energy right now—high-temperature gas-cooled reactors, in the 120-200-MW range, for ordinary sources of power. And reactors in the 800-1,000-MW range, approximately, for production of synthetic hydrogen fuels, to replace petroleum. So, throughout various areas of a country, you will have these higher, more powerful plants, which among other things, will produce your local hydrogen-based fuels. You'll no longer get petroleum from a distant country—you'll produce it locally.

You will produce vehicles, which are hydrogen-based-fuel-operated: aircraft, trains, and so forth. They're not just simply electric processes. We need that.

We need also, to deal with the management of the territory, in a way we've never done it before. People say, "Deserts are good." I say, "Deserts are no damned good. Ever try to live in one?" It's never good for your culture, it has lousy effects on your sex life, and so forth and so on. So therefore, you should have a well-managed, comfortable environment—

The Sahara Desert. LaRouche: "People say, 'Deserts are good.' I say, Deserts are no damned good. Ever try to live in one?"

and a healthy one.

And we're going to have to do things in the area of making the use of land-area available to us on Earth, more efficient for a growing population.

A New Global System Based on Nation-States

We're going to also humanize the population, in the sense of raising the standard of living and culture of the population, not to have desperate, poor people. For example: Seventy percent of the population of India, is desperately poor. You have a similar problem in China.

Throughout Asia, you have a problem. Asian culture has never accepted, *yet*, in general (maybe in Korea and some few other spotty places), but has never accepted, yet, the idea of the injustice of having poor people. That is, a very poor, illiterate people. They still say, you can accept a situation where 70% of the population, or approximately that, can be very poor, desperately poor: poor life-expectancy, and the whole bit that goes with that. It's no longer acceptable. It's no longer acceptable in terms of the productivity of the human race.

What we're going to have to do, is build a new system, a global system. It's really not that new: It's simply a new way of thinking more clearly about what we've already learned. We have learned, for example, in modern Europe, that a sovereign nation-state, committed to the general welfare of each and all persons and their posterity, is the only decent way to go. You can not have globalisation, because you must have a responsibility for both the care of the individual person, in terms of the general welfare standards; and you also have to think about the intellectual development, and productivity of that person. Which means, you have to *raise* the standard of living of the population, to the point that you have a cultured population, intellectually, not just a population which is kept alive like cattle in a barn. …

What is Economics?

You see, people don't understand economics. That's part of the problem. They think of economics in terms of accounting.

Now, an accountant is someone who knows nothing about economics, otherwise, he couldn't be an accountant. An accountant is talking with figures and so forth, which correspond to something called money. And, money is not a measure of value. If you don't believe it, you should see the prices today. And, see what you get with them. You should see what's happening on the international markets today. Money is fake today. And, you have people talking about the economy is growing. Yes, the amount of money is growing, but the economy is collapsing! And, as long as people try to explain political issues, and substantive issues, in terms of accounting, they don't know what the hell they are talking about. And any suggestions they make are likely to be incompetent, or worse. Or actually damaging.

Economics is physical.

"The idea that economies are run by financial data is like playing Monopoly," said LaRouche. "And economies don't work that way."

The Creative Powers of Mankind

But, it is physical in a special way. It's physical in the sense that man is not a monkey, though Bush tries. Man is a creative creature. The only living, creative creature known! Man has creative powers of mind which no animal has. Every animal has a relatively fixed potential relative population density, depending upon the conditions in which they live.

If man were an ape, there would not be more than three or four million apes, of our type, cluttering the earth. The reason that we have over six billion people today, is because the human mind is capable of making discoveries of universal physical principle, of comprehending the Universe in which we live, not simply smelling up the rear end of the animal next to it; which accountants do.

So, therefore, the issue is the creative powers of mankind. Creative powers which are denied to exist by every single empiricist. Denied by every positivist. Despised by every exponent of information theory. Denied by every exponent of synthetic intelligence. Popular things these days. People who believe in information theory or synthetic intelligence are incompetents. They're dangerously incompetent …

The problem here, of economics...it is not paper! It is not accounting. It is physical. It is not just physical objects.

The Noösphere is superceding the Biosphere.

Economics is the power of mankind to increase his power, the willpower of man over physical nature. And, it is by production, not by software. It is not by information theory. It's not by services economy. It's by actually changing things. It's creating an environment which is suitable to man. It's power systems. It's water systems. Large scale agricultural development. It's inventions. But, it's, above all, scientific discovery and Classical artistic composition.

These are the qualities of man. That is economy. That is physical economy. The increase, and protection, of man's power in and over nature, to meet the requirements of man. And, as an instrument in nature, to make nature better.

The Biosphere

For example, the great example of this is the question which I have raised often recently, this question of noösphere and biosphere. There are three categories, physical categories, of events in the earth today. One, we call the non-living matter, the abiotic domain. Then you find the same material of the abiotic domain, when it passes through living organisms, undergoes the changes in states which never occur in the abiotic domain of the same material. It then discharges this result back into the environment, which gives you the biosphere. So, you have, on this planet, you have, the planet has been changing its composition, over billions of years, especially since the oxidation phase, about two billion years ago. It has been changing the composition so that the crust of the earth is increasing in weight, relative to the earth as a whole. But, also, not only the crust, but the atmospheric crust, the atmosphere above the oceans and land has been increasing as a percentile of the total planet. Now, the planet, otherwise, is abiotic, essentially non-living processes.

Living processes have changed the earth by increasing the crust as a manifestation of the power of life over non-living things. And life is a principle. Nothing is ever generated that's living, from non-living processes. Life comes only, is generated only, by living processes. Life is injected into the non-living process, but it never comes from within the non-living process, as such.

The Noösphere

Then you have another one. Human cognition. Now you find that the amount of the earth's weight, which is attributable to the activities of man, and man's intellect, as opposed to the biosphere, is increasing relative to the biosphere, as well as relative to the planet as a whole.

So, human thought, human cognitive creative thought, is a more powerful force than life itself, and a more powerful force than any non-living process. That is really what economics is.

And, it lies in the development of the individual mind of the individual person as a social person, to the degree that that person is helping to generate discoveries, which applied to nature, applied to the conditions of life, will improve man's power in the Universe.

The New Citizen

Published & printed by:
Citizens Media Group Pty Ltd
595 Sydney Rd Coburg Vic
PO Box 376 Coburg Vic 3058
ACN: 010 904 757
Tel: 03 9354 0544
Fax: 03 9354 0166

Editor Craig Isherwood

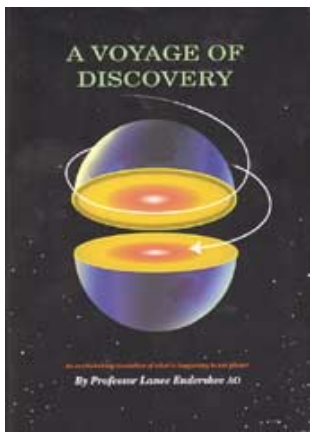
The *New Citizen* newspaper is the official publication for the federally registered political party, Citizens Electoral Council of Australia.
Copies of this and past editions can be purchased as single copies by telephoning 1-800-636-432, Mon - Fri 9.30 - 5.00 pm or writing to the above postal address.

The World Is Running Out of Water!

Australian Professor Lance Endersbee has made a profound contribution to understanding the Biosphere, and what must be done to preserve and expand it, in his recently-published book, *A Voyage of Discovery: A History of Ideas About the Earth, With a New Understanding of the Global Resources of Water and Petroleum, and the Problems of Climate Change.* A former Dean of engineering and former Pro-Vice Chancellor of Monash University, a veteran of the Snowy Mountains Scheme and a world authority on rock behaviour and tunnelling, Prof. Endersbee proves in his new book that world ground water is not replenished by rainfall, contrary to accepted theory, and that, in fact, the world's sources of fresh groundwater are rapidly running dry.

Prof. Endersbee recently presented a copy of his book to the world's leading economist, Lyndon LaRouche, and LaRouche has subsequently stressed the issue in all his speeches and writings, and in his outline of the urgent tasks mankind must tackle over the next fifty years. The following are excerpts from Chapter 1 of Prof. Endersbee's book, along with selected graphics. Given Endersbee's findings, LaRouche emphasises, the world has no choice but to engage in building many thousands of nuclear plants over coming decades, in order to create the huge volumes of fresh water necessary to sustain life on this planet. The reactors would initially be of the super-safe type pictured on the back page of this *New Citizen*.

This reality defines Australia's future, as well, since we are rapidly depleting the world's greatest underground freshwater supply, the Great Artesian Basin. Even without that depletion, Australia's chronic, growing shortage of water resources clearly indicate that we, too, must go nuclear on a large scale. For that we are brilliantly equipped since we have the world's largest exploitable resources of both uranium and thorium, each of which can be used for nuclear fuel. And, since we are surrounded by ocean, it is absurd that we should suffer water shortages: all we have to do is desalinate it, and we could provide bountiful supplies to all our cities and green our entire continent.



Professor Lance Endersbee's fascinating book is available from the Monash University Bookshop. Tel. 03 9905 3111 or http://www.bookshop.monash.edu.au

Prof. Endersbee's opening statement from Chapter I

Around the world, ground water from deep wells is the main source of drinking water for over three billion people. In addition, a large proportion of the food supply in many poor countries is based on irrigation from wells.

However, almost all of the world's wells have falling water levels, and declining yield, and already, many have run dry.

These deep water wells cannot be replenished from rainfall. The source of the groundwater that supports these three billion people lies in the interior of the Earth. There is a continuing release of water from the interior towards the surface of the Earth, and we see that in the steam of volcanoes, and the water gushing from deep ocean vents. Over geological time, some of the rising water was trapped in the path towards the surface of the Earth, and accumulated as underground reservoirs of water.

There are resources of groundwater underlying most of the flat lands of the world. From early times, men dug wells by hand, and lifted water in buckets for their needs. Many civilizations were established where groundwater was available at oases or in shallow wells….

Today, in the United States, groundwater provides drinking water for over one half of the population. The same applies in much of Europe, India, China, and many other countries.

The pattern of dependence on groundwater that had continued for centuries began to change from about 1950.

The population of the world was continuing to increase, there was growth of cities and expansion of city water supplies based on the use of groundwater, and in rural areas there was the introduction of mechanical pumps and commercial agriculture based on groundwater. As a consequence, there was a simultaneous and rapid growth in the use of groundwater all around the world. In countries like India and China, in North Africa and the Middle East, the use of shallow hand-dug wells, and hand lifting of water, was replaced by drilled bores and mechanical pumps.

The use of fertilizers enabled a very great increase in yield, but that required much more water. There was a vast increase in the areas under irrigation from groundwater.

There was a rush to exploit the limited groundwater resources. The groundwater was freely available at the cost of a bore and a pump. There was competition to use more and more groundwater. Water tables dropped, and farmers drilled deeper bores, and installed more powerful pumps. Almost simultaneously, all around the world, the wells began to run dry, and governments were quite unable to control the extraction of groundwater, or protect the resources.

Most governments did not know where the wells were, or the depth of the wells. Governments did not record water levels, but were certainly informed when farmers complained when their wells ran dry. Farmers, governments, and their professional advisors, had all believed that the wells would flow forever.

The groundwater rush was like a gold rush; it was a great uncontrolled bonanza. The International Water Management Institute has estimated that the total global withdrawal of groundwater is now about 1,000 cubic kilometers each year, but it is quite unsustainable. This great global rush to exploit available groundwater resources in our time is a one-off extraction of a limited natural resource.

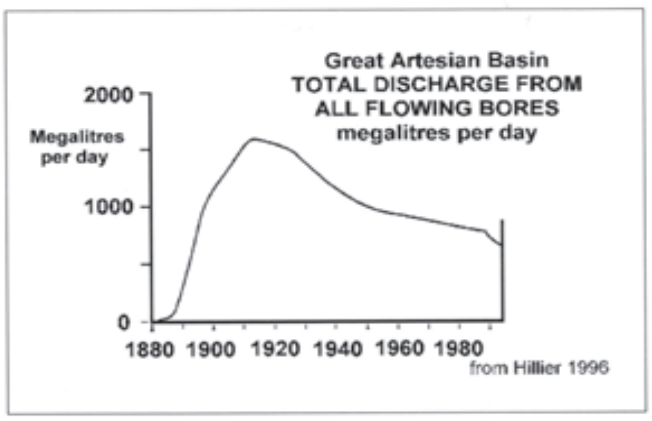
Groundwater has been, and in many areas still continues to be, the best and only readily available source of clean drinking water. This is because the groundwater may be just directly below the place of use, for agriculture, cities, factories, and mines. In most cases the groundwater is available at no cost, except for the cost of the well, and the pump.

The groundwater in these underground reservoirs has accumulated in geological time. The resource can be considered as a great reservoir of water that has been captured in open joints and fissures in the rock, and in pores in porous rocks. In the natural state, prior to intervention to exploit the resource, the underground reservoir was filled to the brim, and overflowed naturally at springs, and into lakes and streams.

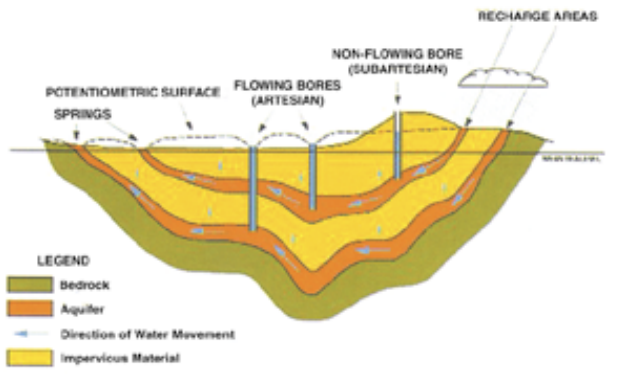
Prior to 1950, most of the world's groundwater basins were in a condition close to a state where the rate of use of the groundwater was compatible with the sustainability of the resource. After over half a century of massive exploitation, far greater than any possible rate of recovery, most of the groundwater basins of the world are now close to the limits of the resource.

The consequences are now evident in many countries. In essence, the world has been exploiting the reserve bank of groundwater at a rate far greater than the rate of natural replacement, and the water bank is becoming insolvent. This excess use of water is a deficit that can never be repaid in our time.

The Great Artesian Basin covers approximately one fifth of Australia, and underlies parts of the states of Queensland, New South Wales, South Australia, and the Northern Territory. Water resources are a state responsibility, and each state is responsible for its part of the Basin.



History of total discharge from all flowing bores in the Great Artesian Basin. The total flow reached a maximum in 1917, and has been declining ever since.



OPERATION OF AN ARTESIAN BASIN

Concept of the operation of the Great Artesian Basin as shown on the web pages of the Queensland Government. Note that the assumed source of water is rainfall on the exposed sediments at the edge of the basin, and that the water is assumed to percolate through the sediments for long distances, rising to the surface through the artesian bores. It is important to note the distorted scale in this diagram. The lateral distance overall is about 1500 km, and the maximum depth of the sediments is about 3 km, a ratio of 500 to 1. If this chart was redrawn to a natural scale, it would be almost a single line across the page.

John Seccombe, Chairman of the former Great Artesian Basin Consultative Council, demonstrating the volume of flow that is available at one bore at his grazing property near Longreach in Queensland. In this case the bore supplies hundreds of kilometres of distribution pipes. It is popularly accepted that the source of such flows is water seeping through porous sandstone at the base of the cased boreholes. That is evidently physically impossible. The author believes that the source must be high pressure steam in the jointed granite below the sediments, and that the steam flowing to the base of the bores has eroded the sediments to form a deep steam cavity down to the jointed granite which now supplies the borehole. (Newspix/David Sproule)

Create Water, Raw Materials With Nuclear Power

The following is an excerpt from Lyndon LaRouche's Prolegomena for a Party Platform: Franklin Roosevelt's Legacy*, now circulating in over a million copies in the U.S. LaRouche wrote this Prolegomena at the request of leading figures in the U.S. Democratic Party to serve as a platform to unify the party, and to provide a positive alternative to the "permanent war/permanent revolution" lunacy of the Cheney/Bush régime.*

With the recent growth of the population of such great nations as China and India, to levels which are already more or less greatly in excess of one billion living individuals, the point has been approached at which the rate of consumption of the essential raw materials extracted from the Biosphere will come to exceed the rate at which those stocks are replenished by ordinary means.

Take as an example, the implications of the presently widespread, and wildly reckless disregard for the increasing degree of dependence of the world's population on the drawing down of resources of fossil water. Only by the forced-draft development of applications of high-temperature fission-reactor processes, such as processes derived from the pioneering Jülich model of pebble-based, high-temperature gas-cooled reactor, as for mass-desalination programs, does mankind presently know of the principal means for ending the dependency on already collapsing levels of fossil-water resources in many parts of the planet.

Fire has always been dangerous, but the civilized life among human beings has always depended upon rejecting the attempt of the Satanic Olympian Zeus to ban mankind's knowledge of the use of fire. Nuclear and thermonuclear-fusion are forms of fire, which must be controlled under the same principle as fire generally; but, as with other forms of fire, the point has now been more than reached, at which efficient control of the characteristic process on which the Solar System is naturally based, fission and fusion power, must be mastered by man, as packs of chlorophyll molecules have done so well in their close cooperation among themselves in producing oxygen and water, by aid of the radiation from thermonuclear fusion processes of the Sun. Without such mastering of fission and fusion, the species of man will not be able to maintain and develop a civilized form of life, and would not, in fact, even exist.

While reactors of the Jülich type in the 120-200 megawatt range are adequate for ordinary support of local economy, reactors in a range four times or more that capacity are necessary for regional production of the hydrogen-based fuels required to defeat the inevitable, ruinous rise in price which is now the pattern in current levels of dependency on low-value petroleum transported at costly net rates around the world today. Contrary to all childish, "Harry Potter"-like, wishful dreams of an actually unattainable "soft life" for all, there are no economical "soft technologies" in existence, or likely to come into existence.

The High-Temperature Reactor is Coming

by Jonathan Tennenbaum

At the beginning of 2001, in the vicinity of China's capital, Beijing, a unique nuclear reactor was put into operation, which is destined to play a key role in the development of the Eurasian infrastructure corridors. This is the "pebble-bed" high-temperature reactor (HTR), first developed in Germany. After decades-long, highly successful operation of the first HTR test reactor AVR in Jülich, and the construction and operation of a 500MW HTR power plant at Hamm-Uentrop, this revolutionary technology became the victim of the politically manipulated hysteria against nuclear energy in Germany. The pebble-bed reactor subsequently emigrated—exactly like the German-developed Transrapid—to China, and also to South Africa.

In the Institute for Nuclear Energy Technology (INET) of the Chinese Tsinghua University, the HTR was realised in an especially promising form for worldwide application. The 10MW Chinese HTR-10 is the prototype of a standardised modular reactor of approximately 200MW-thermal capacity, which can be mass-produced at low cost in the future. On account of its simple construction and operation, inherent safety, small unit-size, flexibility, and ease of maintenance, this reactor is eminently suited for use in developing nations.

Apart from China, these advantages of the HTR have moved the large South African electric power company, ESKOM, to launch an ambitious program for the development and assembly-line production of HTR modules. ESCOM plans, after the success of a first, prototype project, to produce 30 modules every year: 10 for internal consumption and 20 for export (illustrated in Fig. 1). The Chinese HTR-10, already in operation, is supplying important advance data and practical experience for the South African program. In the area of HTR development, a comprehensive international cooperation has emerged in recent years, with the participation of China, South Africa, Germany, France, Russia, and the United States.

The core of the HTR-10 consists of a graphite-lined cylindrical chamber of 1.8 meters diameter, filled with 27,000 spherical fuel elements ("pebbles"), each the size of a tennis ball. Each fuel "pebble" contains about 8,300 tiny particles of enriched uranium, about the size of a grain of sand, embedded in a graphite matrix. Each particle is encased in concentric layers of a high-temperature ceramic (silicon carbide) and carbon material.

The idea of such "coated particles" is that the radioactive substances which are generated by nuclear fission reactions, are permanently trapped within the particles themselves, and cannot escape to the environment. The fuel elements are so constituted, that they withstand even extreme temperatures—up to 1,000°C in normal operation, and even peak temperatures of 1,600°C in the event of a failure of the cooling system—without any considerable quantities of radioactivity escaping to the outside. In addition to this, the fuel pebbles permit a continuous fueling of the reactor. This eliminates the need to interrupt power operation for several weeks for fuel reloading, as is the case with conventional reactors. In the HTR, fuel pebbles are continuously fed in from the top of the reactor, while old ones are gradually removed from the core via its funnel-shaped bottom.

Through the use of ceramic, "sealed" fuel pebbles, it is possible to greatly simplify the entire construction of the reactor, making it inherently safe under all conditions. An accident leading to dangerous escape of radioactivity to the environment is precluded in this reactor, because of its special physical characteristics—above all, the "trapping" of radioactive products in the fuel elements up to high temperatures and the strong "negative temperature co-efficient," which prevents a "runaway" power increase in the reactor. The HTR does not need the intricate, expensive safety systems that are required for conventional nuclear power plants. Yet, this is only one of its many advantages.

A decisive breakthrough over conventional nuclear technology lies in the fact, that the HTR has a much higher operating temperature—900°C, or more. Therefore, the HTR can not only reach a higher thermodynamic efficiency in the generation of electric power, but can also serve as an economical source of process heat for various chemical and other industrial processes. Among these are the environmentally friendly generation of fuels such as hydrogen and methanol from natural gas; coal gassification; process steam generation, metallurgical processes, and so forth.

Where conventional nuclear plants are only suited to, and designed for, delivering electrical power, the HTR can be employed in many more sectors of the energy economy, where energy is needed directly in the form of heat. HTR process heat can replace a part of the costly and environmentally damaging burning of coal, oil, and natural gas.

Chinese experts have in mind, among other things, to use HTRs for generating high-temperature steam, whose injection underground can make it possible to exploit major heavy oil deposits in the country.

In a first period, the heat generated from the Chinese prototype HTR-10 will only be utilised, with the help of a conventional steam generator and a turbine, to generate electrical power. INET plans later to install a compact helium turbine in the primary cooling cycle, in order to explore the possibilities for a very much simpler, and at the same time more efficient conversion of reactor heat into electricity. There are also various possibilities for tapping the HTR's waste heat. The helium turbine plays a large role in the plans of the South Africans, who hope to be able to produce electricity at the extremely advantageous cost of about 1.6 U.S. cents per kilowatt-hour.

The majority of the components of the HTR-10 were produced in China itself, including the reactor vessel, steam generator, and the helium cycle cooling system. Exceptions are the graphite structures for neutron moderation in the nuclear reactor. The special graphite was imported from Japan; the precision machining of the material was done, however, in China.

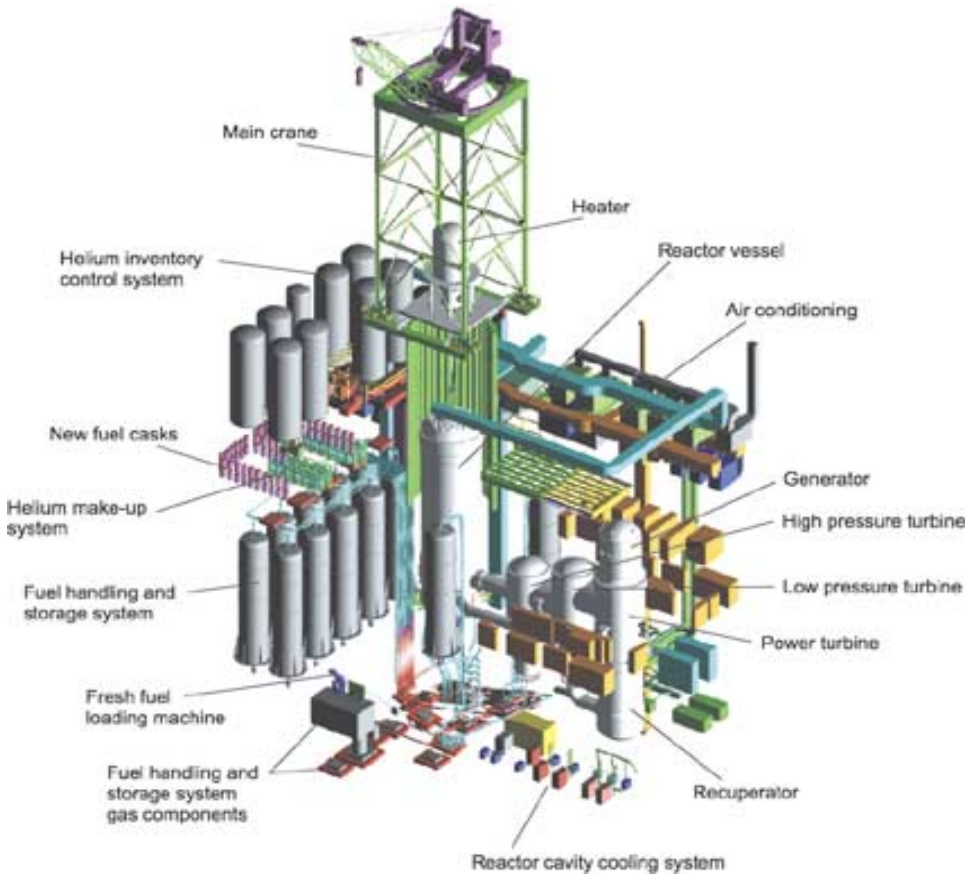


Figure 1 The elements of a pebble-bed modular reactor—the future in safe, efficient power production.

Solve the Water Crisis With Nuclear Desalination

Nuclear desalination, researched since the 1960s, is a technology ready for take-off as a clean, economical source for supplying safe drinking water from seawater. As Lance Endersbee makes clear, there is no time to waste in planning and building desalination plants that can meet the looming deficits of fresh water for the world's population.

Conventional desalination plants powered by the steam or electricity that is produced by gas or oil, have been operating for 50 years, and in 2001, there were 12,451 desalination plants worldwide. In the Gulf region and North Africa, desalination supplies about one million cubic meters per day of water, while Saudi Arabia, which is even more dependent on desalination, has a capacity of four million cubic meters per day. The Mideast and Gulf regions are the largest users, with more than 50% of the world's desalination capacity.

There are three main desalination technologies: reverse osmosis, or RO, which is used in nearly half of today's desalination plants; multi-effect distillation (MED); and multi-stage flash distillation (MSF). All three technologies are still undergoing research to improve efficiency and cost.

Nuclear Desalination Most Attractive

Any power plant—even a small diesel engine—can be coupled to a desalination facility. But nuclear plants are the most attractive power source for desalination, because they are more energy-intensive than plants fired by conventional fuels, and cleaner. Although almost any kind of nuclear plant could be used to power a desalination facility, the fourth-generation high-temperature nuclear reactors which are 50% more efficient, modular, mass-producible, and super-safe are ideal for the job. Because of its passive safety characteristics and smaller design, the new high temperature reactors (either the South African Pebble Bed or the prismatic core model of General Atomics), can be easily sited near the water-distribution systems.

Especially for developing-sector countries, which do not have large power grids, the small to medium-size, fourth-generation reactors are economical, because they can be added to the grid module by module, as demand increases.

For industrialised countries, larger nuclear plants are appropriate. In fact, in the 1980s, the Metropolitan Water District of Southern California, which serves the large desert population of more than 15 million people, proposed building a large desalination facility powered by a high-temperature gas-cooled reactor of the General Atomics design. The desalination process was designed to directly use exhaust heat from the reactor. Although economically and technologically feasible, the project was killed by the environmental Malthusians.

The International Atomic Energy Agency has conducted research and feasibility studies on nuclear desalination since the Atoms for Peace days. In its recent studies, the IAEA has stressed that nuclear desalination is cost competitive against other energy sources; it has inherent advantages, such as no pollution, continuous operation, and a secured fuel supply; and that both the heat and/or the electricity produced by a nuclear reactor can be used for desalination, permitting flexible design concepts.

—Marjorie Mazel Hecht