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Energy

The Integral Fast (Nuclear) Reactor Can Save Us

I send this brief because you are, to me, kin, friend, neighbor or respected citizen. I hope that you will consider it, along with my references, and find the information and its premonitions to be accurate. If the brief is intrusive to you, please be forgiving.

The United States has an energy problem. We consume 20, 23, and 25 percent, respectively, of the coal, natural gas and oil used in the world. Competition for oil by user nations, speculation arising from the uncertainty of supply and the capriciousness of some of our oil suppliers results in wild fluctuations in its cost. This instability in oil prices is disruptive to every segment of our economy. It needs to be fixed!

Combustion of these fossil fuels in densely populated places results in smog. Additionally, many experts believe that the ever increasing emission of carbon dioxide is contributing to global warming. Further, the EPA has announced intent to regulate greenhouse gases as pollutants-gases that are deemed harmful to human health. Compliance with these proposed regulations will cost many billions of dollars. Our government claims that these costs will ultimately be recovered through reduced health care costs. Finally, because we are parties to the United Nations Climate Change plan for reducing greenhouse gases, The House of Representatives approved, on June 9, 2009, a \$150 billion bill which proposes the initial funding for two new initiatives: (1) Carbon Capture and Sequestration (CSS), and (2) the "Cap and Trade" policy for CO2 emissions.

Since it appears that The United States is coming under increasing pressure to reduce the use of fossil fuels, please ask yourself: Where will we get electric power and the fuel energy for transportation 40 years from now? Let's assume that the renewable sources, wind turbines and solar capture, will each provide up to 10%. Add something for conservation-maybe 5%, and remember that energy derived from wind and solar systems may vary based on the time of day and the weather.

The answer has to be nuclear power, doesn't it?

Nuclear power can support transportation systems based either on hydrogen or electric motors and batteries. It doesn't matter at this moment which technology wins out. If this be true, then we **must** resume the nuclear power development programs which were abandoned, for political reasons, 30 years ago. Let's now get the safety issue out of the way. There have been no civilian deaths from nuclear power plants except for the reactor failure in Chernobyl, Russia. The Chernobyl reactor design would not have been approved in the United States. There are 200 nuclear reactors in America and 440 worldwide. There is a lingering concern for safety within an uninformed public, but 30 years safe operating experience in 8-10 different countries is very reassuring. On the

other hand, in the well established industries that burn fossil fuels, it is claimed that greenhouse gases and smog account for 24,000 deaths from lung disease and 40,000 heart attacks each year.

The world's operating nuclear reactors are mostly second generation light water reactors (LWRs), except for a few fast reactors. Third generation reactors, such as the Westinghouse AP 1000, provide orders of magnitude improvements over the existing LWRs . The Nuclear Regulatory Commission (NRC) has received, in the past three years, 19 permits applications for 27 reactors. The capacity of each reactor is generally (1) GWe (a billion watts). Such reactors generate 100 tons of nuclear waste per year. From the beginning, nuclear scientists planned to use fast reactors in series with LWRs. This arrangement is needed because LWRs consume only 1% of the available energy in nuclear fuel, leaving valuable waste that must be sequestered for periods ranging from 30,000 to 50,000 years.

America's fast reactor design is called The Integral Fast Reactor (IFR). The IFR is a fourth generation sodium-cooled fast reactor which is combined with an on-site fuel regeneration process. Developed by the Argonne National Laboratory using an experimental breeder reactor (EBR II), the system operated safely for 30 years. The process was proven in all respects, save only fuel regeneration. Argonne scientists estimated that fuel regeneration could have been proven within two years, but the project was terminated for political reasons. Several other countries are reprocessing LWR waste, but it is illegal for civilian companies to do so in The United States. The laws of physics make fast reactors safe. Safe meaning that the reactor is either self correcting, or that it will shut itself down if upset, such as the loss of heat sink or the loss of flow. These upsetting conditions were tested and proven with EBR II. Fast reactors use the waste fuel from LWRs and will consume the remaining 98% of its energy. The residual IFR waste has a radioactive half-life of 300 to 500 years - two orders of magnitude less than the radioactive half-life of the present waste; and its mass, as expected, is 1% of that from LWRs. Once we begin to operate fast reactors, our current waste from LWRs becomes an asset valued at \$30 trillion. Additionally, we have depleted uranium hexafluoride (DUF6) –the non-radioactive waste of the WW II enrichment process- being stored in DOE warehouses. This DUF6 is worth \$70 trillion if it is used as IFR fuel. These two resources, call them waste no more, have a combined fuel value of **\$100 trillion. This is enough fuel to meet all of America's electric power needs for at least 700 years.**

The need for storage sites and transit routes for nuclear waste illuminates both public safety needs and jurisdictional issues. These will be quickly dispatched, however, when the IFR, with fuel reprocessing, is operating. The waste will be so valuable that many states will compete for the fees available for these services.

The developed world is now operating fast reactors and has plans for more. China has just ordered two of Russia's BN-600 fast reactors. The United States began the civilian nuclear industry, but we are now 30 years behind Russia, France and Japan. Our government uses the NRC's glacial pace in approving new operating permits (and the resulting enormous costs for applicants) as a tool to hold the nuclear industry in check. In spite of all this, our nuclear industry has continued to develop and to obtain approval for third and fourth generation reactors. The nuclear industry will be ready when our political leaders say-"Gentlemen, start your engines". And the time may be at hand via The Global Nuclear Energy Partnership (GNEP).

America has agreed to participate in GNEP, a partnership between the "haves" and the "have nots". Associating security with reliable energy, GNEP proposes to provide modular fast reactors to "have not" countries. Spent fuel rods will be exchanged for fresh rods, and reprocessing will be done by partnership hosts- the "haves". There is no need for weapons grade plutonium in this exchange, and thus there is no opportunity for weapons proliferation. Congress has not yet funded GNEP, but most interested parties believe that our best chance for the funding of fuel reprocessing (and the IFR) is through this partnership.

Congress does plan to spend \$150 billion for CSS. New EPA regulations on "pollutants" will increase energy costs by billions of dollars. Shouldn't America's plan to protect the environment include a thriving nuclear industry, one that consumes its own waste and produces power with zero carbon emission? We will need it for survival, because fossil fuels to meet all energy needs will not be available much longer. Further, our generation needs to leave some petroleum and other fossil fuels in place for our grandchildren's use as the raw material for manufactured items they will need.

If you believe that Congress should give priority to funding GNEP, please contact those who hold public office, beginning at the top, saying something like this: : **Please provide The DOE with the funds necessary to restart nuclear development, as envisioned by The Global Nuclear Energy Partnership. America needs to resume reprocessing nuclear waste-for ourselves as well as for others. It's responsible, sensible and necessary. Nuclear Reactors are safe. They have no "pollutants" to regulate, no emissions to clean, or to capture and store. The Integral Fast Reactor needs to be resurrected, because it will convert our radioactive waste into power, and save us vast amounts of money in the process.** Include in your contacts, if you will, The President, US Senators, Congressional District Representatives, The Governor, state senators and state representatives. Speak from your heart, be personal and be brief. Also, **talk with your friends and neighbors!** Feel free to forward this brief.

Returning to the question I posed on page one, Where will we get electric power and the fuel energy for transportation 40 years from now?, you might want to read Joseph M. Shuster's Book, **Beyond Fossil Fools-The Roadmap to Energy Independence by 2040**. For starters, Shuster would have us replace all coal derived energy with nuclear power.

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References: Don Riley rileydon@charter.net; Steve Kirsch www.skirsch.com, especially the IFR Executive Summary; www.ourenergyworld.com and www.GNEP.energy.gov