Only Nuclear Power Can Close Energy Gap

by Marjorie Mazel Hecht

Nuclear energy is the only way to keep the lights on and the wheels of industry turning in the United States and around the world. There is no other way to ensure that the 6.5 billion and growing world population will enjoy the standard of living and longevity typical in the industrial world today. Windmills, solar cells, biomass, and other so-called alternatives cannot power an industrial society.

The energy released from a chain reaction of splitting atoms inside a nuclear reactor has a higher energy flux density than older energy sources like wood, coal, oil, and gas. To get an idea of this, consider that 1.86 grams of uranium fuel equals the energy in 30 barrels or oil, or 6.15 tons of coal.

The higher temperatures of fission enable nuclear to efficiently create hydrogen fuel (as a petroleum replacement) from water, and to efficiently power industrial processing like seawater desalination. Nuclear energy is efficient, clean—and also renewable! Spent nuclear fuel can be recycled—97% of it—into new reactor fuel.

But the "business as usual" method is not going to build the numbers of nuclear plants that the United States, and the rest of the world, need to move civilization forward (and certainly not in the time frame that is required to save millions of lives). Going nuclear is a question of real national security. A nation cannot exist, much less thrive, with an inadequate, decentralized "micro"-energy system of the sort promoted by bio-fools like Amory Lovins. We need a Manhattan Project-type approach to civilian nuclear energy, a Great Projects mission with the funding to get the job done.

Nuclear engineer Jim Muckerheide, the president of Radiation, Science, & Health, who is also the state nuclear engineer for Massachusetts, has proposed such a new public corporation as the only feasible way to tackle the daunting task of building 6,000 nuclear plants worldwide by 2050 to meet projected electricity needs.[1] The Russians, he said, are organizing such a national entity, and have set the goal of building 100 nuclear plants, 40 of them inside the country, and 60 exported by 2030. China has a similar approach, with its National Nuclear Coporation, working with local governments and private vendors to build new plants. Its short-term goal is to build 32 units by 2020.

Here, the Bush Administration has a long-term nuclear

1. See James Muckerheide, "How to Build 6,000 Nuclear Plants by 2050," *21st Century Science & Technology,* Summer 2005.

program with the goal of building an initial nuclear fuel recycling facility and a fast "burner" reactor to eliminate long-lived transuranic isotopes from spent nuclear fuel, in the next 15 years. But the program is driven by a political ideology of centralizing control over the nuclear fuel cycle, not putting multiple units on line. The U.S. nuclear industry meanwhile is caught in its supposed bottom line, justifying each planned new unit individually against the variations in coal and oil prices and financial risk reduction, and trying to get as much as possible out of its existing fleet of nuclear plants. The industry is not willing to invest in new plants without government guarantees.

The bulk of the necessary funds should be generated in the same way that Lyndon LaRouche has proposed for the rest of the nation's infrastructure: a system of low-interest (1 to 2%) government loans to jumpstart nation-building infrastructure. The payback for such investment over the coming decades would be enormous.

The Safety Question

The rational person can comprehend the precautions and risks involved with an advanced technology like nuclear. But those with an irrational fear of "nuclear" are like the many-headed hydra; every time one question is reasonably answered, another fear will pop up.

Radiation is all around us (from cosmic rays), and inside us (from the foods we eat). Natural background radiation varies considerably from place to place, based on altitude. High-altitude Denver, for example, has about twice the natural radiation of Dallas. On average, Americans get about 360 millirems per year of radiation. In addition to natural background radiation from cosmic rays, the ground, and building materials, there are man-made radiation sources: coast-to-coast airplane flights add 5 mrem; watching color television adds 1 mrem; one chest X-ray adds 50 mrem. How much do all the nation's nuclear plants add to the average? About 0.003 mrem. Coal plants emit more radiation than nuclear plants because of the natural radiation in coal, which is discharged at the stack!

As Edward Teller liked to quip: "In sleeping with a woman, one gets just slightly less radioactivity than from a nuclear reactor; but to sleep with two women is very, very dangerous."

The biggest radiation myth is that all radiation is dangerous, no matter what the dose. In actuality, low-dose radiation has been shown to be beneficial to human health. It is wrong to take the known damage from high-level radiation exposure and extrapolate this damage down to a zero dose. Instead, as one nuclear scientist has suggested, we should have a "radiation deficiency" standard, because people who live in areas of relatively high background radiation turn out to live longer and be healthier than their counterparts in sea-level areas![2]

But are nuclear plants themselves safe? The U.S. nuclear plants have multiple safety systems and are built with thick concrete containment walls. Today's nuclear plants operate like other power plants: Heat from burning coal, oil, gas, or uranium is used to boil water and create steam, which then turns a turbine to produce electricity. Operators are trained and plants are highly regulated.

Tomorrow's plants, the fourth-generation nuclear reactors, are fail-safe, and automatically shut down if there is a problem, even without the assistance of an operator. The fuel cannot be damaged by accident conditions. Can things go wrong? Yes. But the risk to the public of a nuclear accident is very small—much smaller than the risk of driving a car, smoking a cigarette, or doing any number of risk-laden activities, including working in (or living near) a coal-fired plant.

We need to build many kinds of nuclear plants: large ones for urban-industrial centers, medium and small reactors for developing nations and remote areas, breeder reactors to create new fuel, fusion-fission hydrids to make the transition to a fusion economy. But the workhorse of the next generation of nuclear reactors will be the modular high-temperature gas-cooled reactor, both the Pebble Bed Modular Reactor (PBMR) and the Gas-Turbine High Temperature Reactor (GT-MHR). The first, originally a German design (a small plant operated there from 1967-89), is being built in South Africa, and a small plant now operates in China. The second, designed by San Diego-based General Atomics, is being built in prototype in Russia, with the aim of burning excess plutonium from weapons.

The advantages of these reactors is that they are small enough to be modularly produced on an assembly line and shipped to the plant site for assembly, thus cutting production costs. The nuclear site can be configured to start with one or two units and build up to six, as needed, making use of a single control building.

The GT-MHR is a 285-megawatt plant with passive and inherent safety features that make a meltdown impossible. Its tiny fuel particles are encased in ceramic spheres, which serve as "containment buildings" for the fission process. The overall design prevents the reactor from ever getting hot enough to melt the ceramic spheres that surround the nuclear fuel. The spheres are mixed with graphite and shaped into cylindrical fuel rods.

The high temperature of the reactor (1,560°F), compared to the 600°F limit of a conventional water-cooled nuclear reactor, gives it greater generating efficiency, and allows a wide range of industrial applications. It uses a direct-conversion gas turbine, with no steam cycle. The heat is carried by the helium gas, which is also the coolant. This simplifies the system and increases efficiency. The GT-MHR is 50% more efficient than conventional light-water nuclear reactors.

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2. For further reading: See nuclear articles accessible from the home pages of *EIR* http://www.larouchepub.com and *21st Century* http://www.21stcenturysciencetech.com.