REASONS WHY...

YOU CAN'T 'NUKE' GLOBAL WARMING

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News accounts of the legendary summer heat wave of 2006 contained two news stories about nuclear energy, one widely broadcasted, one conveniently ignored.

The first was about the record-setting electricity use, fuelled by the region's demand for air conditioned relief. Exelon and other nuclear utilities attributed their success at meeting this demand to nuclear power.

The second story barely appeared after the heat broke, when people weren't paying attention. Both here and internationally, the demand for electricity was indeed met, sometimes by nuclear power. However, in many cases these reactors were either not allowed to run at full power, or, if they were, they were given permission from regulators to exceed safety and environmental standards. In other words nuclear plants were allowed to keep the air conditioners running, but only by risking an accident or further damaging an already heat-stressed environment.

In Illinois Exelon's four Quad Cities and Dresden reactors had to curtail power output because the hot water discharged into the Mississippi and Illinois Rivers exceeded EPA heat discharge regulations. This occurred previously in 1988, when then-ComEd reactors experienced 100+ reactors days of curtailed power output or complete shut down related to excessive thermal discharge into Illinois' rivers. This subsequently resulted in Com-Ed spending millions of dollars for water-cooling retrofits for their reactors. Exelon reactors came close to power curtailment once again during Illinois' 2005 drought.

During the 2006 heat wave Exelon's Limerick reactor in Pennsylvania also curtailed power output. Across Lake Michigan from Exelon's Illinois reactors, the Donald C. Cook Unit 1 reactor building overheated on July 29-30, resulting in an automatic reactor shutdown. Cook literally got cooked.

Europe experienced similar problems. As it did during the 2003 heat wave which killed over 10,000 French, the French government gave permission for reactors to exceed heat discharge and even safety standards at 37 of its 54 reactors. Germany allowed several reactors on the Elbe River to discharge water in excess of thermal standards. One reactor in Spain was shut down completely rather than be allowed to thermally contaminate the Ebro River.

Nukes in a Global Warming World

While these weather incidents were certainly severe in nature (resulting in 30,000 deaths in Europe in 2003), they are by no means reflective of the environmental conditions or severity we might face in a full blown Global Warming world. Using these notable heat waves as examples, it can be assumed that – without more creative adaptive responses on our part -- the demand for even more electrical power for cooling will increase in such a world. If the nuclear industry gets its way, that means more nuclear reactors.

Most models predict a number of conditions that are obviously unfavorable for running nuclear plants. In continental interiors along existing river systems, the models predict such things as an increase in severe weather events (tornadoes, violent rains/snows); stressed, overheated and depleted river systems; seasonal "creep" (earlier springs, later autumns); hotter nighttime temperatures. On the ocean coasts the models call for elevated sea levels; and possibly more frequent and more powerful hurricanes. Evaluated as a *gestalt*, these conditions argue convincingly against the construction of more nuclear power plants.

Take for example the condition of our rivers. Nuclear power plants require the intake of river water to create the steam needed to drive the turbines to generate electricity, as well as to cool the reactors. They then discharge enormous quantities of heated water back into cooling lakes and ponds, and ultimately the rivers themselves. Coal burning power plants do the same thing, but with a critical difference, as will be seen below.

In a Global Warming world, it is anticipated that our rivers will suffer a number of conditions largely absent today, but strongly indicated by the 1988, 2003, 2005 and 2006 heatwave/drought conditions: lower water volumes and flow rates, due largely to expected higher temperatures and faster evaporation, drier conditions, less spring run-off and snow melt, and less rain fall recharging the volumes. The change in volumes and flow rates has serious implications for public health and safety, as well as reactor operation.

With smaller volumes of water, the risk of overheating the rivers from increased hot water discharge from power plants increases, as has already been demonstrated. In a Global Warming world, electricity from the power plants is likely to be in greater demand. Under these conditions only several negative choices are available: 1.) provide the demand and thermally pollute the rivers beyond regulatory limits, on a more frequent basis. This may ultimately have the effect of killing the entire aquatic system locally and downstream; 2.) attempt to lessen the effects on the rivers by investing more millions of dollars for additional cooling towers and baffles for the powerplants, thus driving up the real cost of nuclear power even more; 3.) curtail power output to preserve the rivers, and meet electrical demand in some other more creative way not involving steam production. In each case, nuclear power comes out a losing investment. Thus, when needed most, reactors may not even be available.

But heat discharge is not the only problem. Greater scrutiny needs to be given to radioactive discharge and water chemistry in depleted, overheated river systems.

Currently, the Nuclear Regulatory Commission (NRC) has promulgated regulations concerning allowable levels of radioactive discharge into waterways. Flaws in the cladding around the highly radioactive fuel rods make inevitable small releases of radioactive elements into reactor cooling water, and sometimes even the steam systems. The intense radiation environment of the reactor core further "activate" other materials in contact with the reactor core. Tritium – a radioactive form of hydrogen – is also created. All of these systems are bathed in water, either for heat transfer or reactor

cooling. While a great deal of these radioactive isotopes are filtered out of the water, some either cannot be, or get through the filtering process. The NRC allows this contamination, provided it occurs below mandated levels. The critical assumption is that if the levels are low enough, discharging the radionuclides into sufficiently large volumes of waters will serve to further dilute radiation exposures to even lower levels. The solution to pollution is once again dilution.

This whole sequence of events becomes invalid if the volumes and flow rates of rivers are severely curtailed. NRC and nuclear utilities can no longer simply assume that the water volumes will be there in the future to dilute the radionuclides; nor that the water will move fast enough to swirl the radioactive effluents downstream. The result is likely to be a more localized re-concentration of the radionuclides into the remaining and surviving animals and plants; or into the river bottom sludge. No dilution – no solution.

Further complicating this scenario is the fact that locally hotter water temperature is likely to accelerate chemical and biological activity and reactivity in the water. This could result in the creation of compounds that previously were not a part of the local biosystem. Coupling this with a gradual increase in the presence of radioisotopes, even within so-called regulatory limits, potentially changes the whole profile of the local biosystems around nuclear reactors. It is known that radiation bombardment of some normally benign organic compounds can produce new compounds that are either toxic or carcinogenic. Increased radiolysis of the surrounding waters can result in the producing of chemical free radicals and other reducing agents. Finally, since whatever remains of the biota (especially at the bacterial and algae level) will be more bioactive in the warmer waters, the potential for more rapid bio-re-concentration of these compounds and isotopes into the local food chain is a distinct possibility.

The same rivers used by nuclear reactors as a water source are also often shared with local communities which use them as a source of drinking water. Chemical and radiological alteration of the waters flowing downstream from reactors may have unforeseen health effects on these communities whose very survival depends on having a safe drinking water supply.

These scenarios suggest a need for further detailed investigation and modeling of the effects that reactors will have on inland waterways in the real Global Warming world.

More creative, realistic options needed

As intimated above the magnitude and great degree of uncertainty about the specific climatic changes in the Global Warming world call for far more creative, adaptive and flexible responses to meet energy requirements. And as suggested above disengaging electricity production from steam/water use in a world where water will become an increasingly precious commodity would seem to make logical sense.

If Life gives you lemons, make lemonade; if the Global Warming world gives you more sun and wind, harness it! Preparing to use flexible, adaptable, de-centralized solar power and wind power which will have no effect on damaging our increasingly precious water supplies makes sense. These power sources are not tied to rivers that may or may not flow. While it may be difficult to accomplish, relocating wind farms to follow changing wind patterns and human land use is infinitely more easy to accomplish than relocating two 1,000 MW, nine-story high nuclear reactors chained by design to already stressed river systems. The same can be said for solar panels. It makes no sense – environmentally, economically, or from a strictly energy perspective – to meet this 21st Century energy challenge with essentially 19th Century technology. It's time the nuclear power Luddites understood this, and made way for the energy resources of the future that are more adept at meeting energy needs under uncertain and capricious Global Warming conditions.

While policy makers and the public are desperate to find a painless and magical methadone-like cure for their electricity addiction, it is critical that they take a long, hard scientific look at what that Global Warming world will look like, and then decide whether nuclear power can even function under true global warming conditions, let alone assist in abating it. At stake is literally trillions of dollars in investment, and precious and unrecoverable lost time that could have been used to create and implement better, quicker, cheaper and more effective energy options.

Today's climatic conditions are far less extreme than those anticipated in a full blown global warming world. They serve as a warning that nuclear power is ill-suited to help us in a global warming world – unless we are willing to either further destroy the environment, or risk increased likelihood of a nuclear accident. Indeed, the recently reported reactor failures and overheated containments suggest that, rather than nuclear power saving us from the threat of Global Warming, someone needs to figure out ways to save nuclear power from Global Warming.

When nuclear reactors will be needed most, they are likely to be least available, and then only at greatly increased risk. Contrary to the propaganda nuclear power spin-meisters and their editorial allies are feeding a gullible public, you can't 'nuke' global warming. ■

Post Script: On July 23, 2007, the editorial boards of both the *Los Angeles Times* and the *Salt Lake City Tribune* published major detailed editorials against the use of nuclear power to fight global warming. The *L.A. Times* said it succinctly:

> *"**A WARMING WORLD -- No to nukes:** It's tempting to turn to nuclear plants to combat climate change, but alternatives are safer and cheaper."*

After 19 years of stating that message, the vindication was most welcome. ■

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NEIS was founded in 1981 to provide the public with credible information on nuclear power, waste, and radiation hazards; and information about the viable energy alternatives to nuclear power. NEIS has just launched a global warming abatement program aimed at individual action and responsibility titled, "You Can't 'Nuke' Global Warming!" For more information and to purchase the campaign kit, contact NEIS, or visit the NEIS website at:

http://www.neis.org

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