Dinosaurs and Dragons

The Three Mile Island Unit 2 (TMI-2) reactor, near Middletown, Pa., partially melted down on March 28, 1979. The public outrage lasted but a short time, assuaged by a plethora of Nuclear Regulatory Commission assurances, tightening of requirements and inspections. Citizen oversight and community awareness groups proliferated in the neighborhoods of nuclear power plants, and the fast track for nuclear additions to the electricity system came to a screeching halt. In spite of taxpayer subsidies of three billion dollars annually to the industry, the early promise of "electricity too cheap to meter" never became reality.

Thirty-four years after TMI, we see nuclear power options in a struggle to resume an upward trajectory, some even hailing it as the new "green" energy because it allegedly poses no greenhouse gas emissions compared to fossil fuel combustion. Before the green flag is totally draped around this option, I would like to raise three points of caution. First, the disposal of highly radioactive spent fuel arrays still has no permanent solution in the United States. Second, the thermal electricity production system from nuclear power still uses 18th century technology that converts only 1/3 of the fuel value to useful electricity in the Rankine cycle. The cooling requirements for nuclear power plants impose a tremendous burden on water supplies, average of 800 gallons per megaWatthour of electricity produced. Third, national security dangers from nuclear proliferation and domestic nuclear installations cannot be ignored. Each nuclear power plant in operation today has beside it a spent fuel pond, potential targets for terrorist activity, or even inadvertent disruptions such as took place at Fukishima Daichi. Systems for concentrating uranium U238 isotope for fuel production also can be used to generate weapons grade material.

I support nuclear power, in fact the earth runs on nuclear power: the fusion of hydrogen in the sun. It is exactly the level of power to bathe the earth in 89 peta-watts of energy (that is 89 with fifteen zero's) to convert to useful work. It is 93 million miles away, far enough to assure safety. It is constant, and far in excess of the wildest projections of the International Energy Agency for 34 Terawatts (34 with twelve zero's) of power by 2050. We need to stop diverting resources and ingenuity chasing ineffective, inefficient, potentially dangerous and unnecessary technologies. We need to focus on adapting our energy use patterns and efficiency techniques on a power source that is falling on us daily for free. We have yet to optimize the infrastructure, metrics or technologies for running our economy on renewable fuels. Instead of trying to sequester carbon from fossil coal, or capture and safely contain the products of nuclear fission for thousands of years, we should be investigating and investing in removing the barriers to renewable energy systems.

On the surface, nuclear power may look "green" as it emits relatively little Carbon Dioxide in the power production process. However, it should remain a distant future choice of last resort because of the serious limitations of using this technology. The amount of resources necessary to produce useful electricity from this resource far exceeds

adaptive technologies that use passive solar design, geothermal earth energy, wind power and renewable bio-fuels for either anaerobic digestion to make bio-gas or burning. We need to establish renewable and sustainable systems of energy capture and use, not simply chase fuel substitution.

Sources:

- U.S. Nuclear Regulatory Commission. Backgrounder on the Three Mile Island Accident
- Lawrence Livermore National Laboratory Energy Flow data; water use in power plants data 2011 www.llnl.gov

- 1992 U.S. Energy Information Administration (EIA) analysis, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets* www.eia.gov . EIA determined that the value of the subsidy to the nuclear industry as a whole was roughly $30 million per reactor per year, or $3 billion annually ($1991). The full subsidy value of the Price Anderson Act from its inception through today thus likely exceeds a hundred billion dollars.

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