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Gaps in APS Position on Nuclear Energy

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The American Physical Society recently issued a position paper entitled "Nuclear Energy: Present Technology, Safety, and Future Research Directions: A Status Report" (<www.aps.org/public_affairs/popa/reports/nuclear.cfm>). It is an excellent snapshot of the current status and future potential of nuclear energy -- but there are a few matters that should have been more carefully addressed.. As noted in the Preamble, the earlier, 1993 APS position on nuclear energy called for "the development and implementation of programs for the safe disposal of spent fuel and radioactive waste." We have some comments on voids that the current report leaves in those areas, and others.

Economics. **In the section subtitled Advanced LWR Designs, the report states that "the cost of electricity from these plants has also been improved and is estimated to be lower than today's nuclear plants by about 20%. Yet, the capital cost is still too high to be competitive with gas-fired plants in the U.S. rate deregulated market, assuming present gas prices." Fair enough as stated, but this is a red herring. Gas plants now are used mainly for peaking. If U.S. electric utilities ever turned to gas-fired plants to supply base load on a large scale (which is what advanced LWR designs are all about), the demand for natural gas would balloon, and with it the price of gas-fired electricity and the cost of heating homes.**

Safety. **In the subsection Economics and Safety, the report states that "the safety of operating reactors has been excellent since the TMI and Chernobyl accidents." This is true, but the two accidents should have been distinguished. TMI was scary, and caused some panic, but hurt no one except the pocketbooks of local rate payers. A Chernobyl type accident (a graphite fire) could not happen to civil reactors in the U.S. -- none uses a graphite moderator. This distinction is important.**

Reprocessing. **The last sentence of the "Security" section maintains unequivocally that "reprocessing separates out plutonium, which is a serious proliferation**

concern." While this is true for the aqueous "Purex" process that is used to treat thermal-reactor fuel, it is simply not a valid generalization -- a startling blunder by the authors of the APS evaluation.

For one example, it is no secret that pyrometallurgical processing, as developed at Argonne National Laboratory for use with metal-fueled fast reactors, is incapable of producing plutonium of the chemical purity needed for weapons. If the starting material is spent oxide fuel from thermal reactors, the initial reduction step also can be done by a process that does not involve separated plutonium.

Indeed, the whole issue of reprocessing should be reexamined by the APS. Perhaps the foremost reason has to do with waste disposal.

<u>Yucca Mountain.</u> The problems associated with waste disposal stem primarily from the notions that spent reactor fuel is waste, and that this waste must be isolated for 10,000 to 20,000 years. Change the assumptions and the problem disappears.

In the light of new technologies, past reasons for not reprocessing spent fuel are no longer convincing. Anyway, the issue is moot, because other nations are already reprocessing their fuel (using Purex). With fast reactors and proliferation-resistant pyroprocessing, the time the actual waste needs to be isolated drops to less than 500 years. Geological disposal for that long is almost trivial.

Appropriate reprocessing, coupled with advanced fast reactors, can extract from the mined uranium over 100 times the energy that is obtained without reprocessing. While this may not be important in the current market with its glut of enriched uranium, that will change. As we understand it, current plans are to keep the spent fuel stored in Yucca Mountain retrievable for 100 years. That is certainly prudent -- our generation has no moral right to deny that rich energy source to future generations. Yucca Mountain should be thought of as an interim spent fuel repository.

As for the safety of the waste, that's another red herring. Already there is far more radioactive waste under the ground at the adjacent Nevada nuclear test site than would ever be expected to leak from the Yucca Mountain repository (even in the absence of recycling). At least four tons of plutonium remains at the test site as

bomb residue, along with a much greater quantity of radioactivity due to fission products. The safety of this totally unconfined residue has never become an issue — evidence that concern over the repository is not really about public safety, either now or thousands of years from now.

The debate over Yucca Mountain is really a surrogate for the disagreement between those who see nuclear power as essential to meet the burgeoning energy needs of the world, and those who see it as an evil genie that should be stuffed back into the bottle.

While technological advance will continue, the reassuring outlook for the safety and proliferation-resistance of nuclear power would be more apparent if the implications of even the current state of the art were more widely understood. The APS has been helpful in this regard, and would be even more so if it were to round out its analyses.

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