Testimony of Arjun Makhijani on Secure Storage of Nuclear Spent Fuel before the House Subcommittee on National Security, Emerging Threats and International Relations

(written testimony was submitted for the record)
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by Arjun Makhijani, Ph.D.

Mr. Chairman and members of the Subcommittee, thank you for including my testimony in the record of today's hearing. Let me mention my background briefly. I am president of the Institute for Energy and Environmental Research [1] and have authored or co-authored many studies on nuclear waste management and related topics for more than two decades. In 1972, I received a Ph.D. in Engineering from the Electrical Engineering department of the University of California at Berkeley, where I specialized in nuclear fusion. I am the principal author of the first technical assessment of the energy efficiency potential of the U.S. economy, which was completed in 1971.

Nuclear power reactor spent fuel should be stored in a manner that would not result in catastrophic damage even if the storage sites are subjected to a terrorist attack of the magnitude that occurred in New York City on September 11, 2001. This would require hardening of spent fuel storage. Were that done, spent fuel storage sites would be become unattractive as terrorist targets. That is because it is very unlikely that a terrorist group would go to the trouble of planning and implementing a complex and dangerous attack on a spent fuel storage facility if there were essentially no prospect of producing dramatic, catastrophic damage. Hence security would be achieved not only by drastically reducing the damage should an attack occur, but also by making the storage sites unattractive targets. In other words, hardening of spent fuel storage should be seen as a measure that could help prevent a terrorist attack.

Spent fuel storage in pools outside of reactor secondary containment does not provide the requisite level of protection to achieve the goal stated above. [2] A range of terrible outcomes are possible from serious attacks. This is clearly indicated by government studies. For instance, storage of spent fuel at Indian Point is currently unacceptably vulnerable and steps should be taken to harden storage. Further, dry cask storage of spent fuel in present day systems licensed by the Nuclear Regulatory Commission also does not meet the criteria of secure, hardened storage, in my opinion.

Storage of spent fuel must be explicitly hardened against terrorist attack in order to minimize the risk of attack and the consequences in case it does take place. The criteria for Hardened On-Site Storage (HOSS) are:

1. It should not result in catastrophic releases and should be able to resist almost all types of attacks. The estimated amount of radioactivity that would be released in even severe attacks should be small enough that the storage system would be unattractive as a terrorist target.
2. It should be able to withstand a direct hit by a large commercial airliner full of fuel or anti-tank weapons without catastrophic offsite releases.
3. The individual canister locations should not be easily detectable from offsite. This means that it

must not be visible from offsite and the infrared signature should be obscured enough to prevent a direct hit in case of attack with infrared guided munitions.

One approach to HOSS would be to construct silos resembling small hardened missile silos. Spent fuel could be put in large casks that are then emplaced in these silos. A building would cover the entire set of silos. Silos of modest depth, possibly twenty or thirty feet located in this way could be designed to meet all the criteria I have set forth above. I have not costed such a system, but would venture to suggest that it would increase the cost of power by less than ten percent.

All the spent fuel that can be removed from the spent fuel pool should be mandated to be put into HOSS. This means that all spent fuel that is cool enough should be removed from the pools and put into hardened on site storage. However, some of the spent fuel at the plant cannot really be made very secure so long as the plant is operating. This is because fresh spent fuel must be stored underwater in a spent fuel for several years to prevent a meltdown. It is possible to increase the robustness of spent fuel pools to attack and this should be considered.

The surest approach is, of course, to close nuclear power plants and eliminate spent fuel pools. It is possible to design a different type of power plant that would not require spent fuel pools. Whether such plants may have other vulnerabilities and whether they should be designed and licensed should be put in the context of the overall debate on nuclear power and energy policy. But the possibility of other types of plants does not and should not affect the security debate on the current design of nuclear power plants, which all require spent fuel pools.

It is clear that a plan for the shut down of spent fuel pools, and hence of the current type of nuclear power plant (light water reactors), is desirable from the point of view of security. I recognize that nuclear power plays too large a role in the US electricity system for all nuclear plants to be closed in the near-term. But some plants can be shut quickly. Every effort should be made to prioritize the shut down of plants so as to minimize the risk in places that appear to be more vulnerable than others. For instance, I believe that an urgent effort should be made to line up a reliable source of replacement power for the nuclear power reactors at Indian Point and to implement a conservation and efficiency plan so that these reactors can be closed as soon as possible with grid reliability being maintained. This is because Indian Point is in a densely populated urban region that terrorists have attacked, where there is no reasonable evacuation plan, and where spent fuel is stored in vulnerable pools.

While it is not possible to shut down all nuclear power plants in the near-term, it is certainly possible to phase out nuclear power plants. A nuclear power phase-out can and should be made compatible with significant reductions of emissions of greenhouse gases. A technical assessment I did in the immediate aftermath of the September 11, 2001 tragedy to assess this issue concluded that it was feasible to close all nuclear power plants and to reduce carbon dioxide emissions by 40 percent or more in three to four decades. With very vigorous government policies it may be possible achieve these goals faster. My study is entitled Securing the Energy Future of the United States. It can be downloaded from the website of the Institute for Energy and Environmental Research.

Notes:

1. The website of the Institute for Energy and Environmental Research is www.ieer.org. The address

is 6935 Laurel Avenue, Takoma Park, Maryland 20912. ? Return

2. This does not mean that storage inside secondary containment does not need to be further hardened. A different evaluation is needed of the consequences of attack in such cases. I am not addressing this issue here. ? Return