Comments on "Nuclear Waste Management in Canada: The Security Dimension," by Prof. Franklyn Griffiths

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September 9, 2003

Professor Griffiths' cogent essay does an excellent job of identifying the core issues and numerous complexities that policymakers the world over must confront when trying to minimize the security risks posed by nuclear waste. Among other key points, the essay makes clear that (1) purely physical considerations are only one dimension of the security picture; (2) a narrowly defined "national security" approach to nuclear waste management policy, by excluding the public from meaningful input, will likely fail to gain the consensus necessary for successful implementation; and (3) it is no easy task to develop a nuclear waste management strategy that can simultaneously fulfill all national security and human security objectives.

My own view of how the concept of security should be applied to nuclear waste management is somewhat more narrowly focused than that of Professor Griffiths. While I agree that societal considerations are of fundamental importance, I also feel that the purely technical aspects of the issue are more complex than his essay suggests. The physical aspects of nuclear waste security indeed may be "fairly easy to understand" on a conceptual level, but they are far from easy to analyze in detail. Yet the satisfactory resolution of outstanding technical issues is a necessary prerequisite to development of a nuclear waste management strategy that will adequately protect the public and will achieve wide acceptance.

Key technical issues include how to determine the risks to public health and safety from terrorist attacks on spent fuel, and how best to mitigate these risks, for all potential storage and transport configurations. This question depends both on physical considerations, such as the range of radiological releases that could result from terrorist attacks, and policy considerations, such as the severity of the postulated "design basis threat" (which establishes the level of protection that private industry and/or government should provide).

Essential to this effort is the capability to conduct threat, vulnerability and consequence assessments that are realistic enough to be credible, but also conservative enough to ensure adequate protection of the public. Both the technical and policy pieces of the analysis are rife with uncertainties that make this exercise resemble informed guesswork rather than objective science. A further complication is the necessity, on security grounds, of withholding much of this analysis from a public that has good reason to be skeptical of policies based on secret information.

Here I would like to illustrate some of the points in the essay with examples drawn from events in the United States in the aftermath of the September 11 attacks. The incoherent and irresponsible manner in which the United States government has responded to public concerns with regard to nuclear waste security after September 11 should serve as an example for Canadians of how not to go about securing the consensus needed to support development and implementation of a sound nuclear waste management strategy.

The United States government remains deeply divided on the dangers posed by nuclear waste storage, transport and disposal. In the face of technical uncertainty, agencies responsible for homeland security, such as the Federal Bureau of Investigation (FBI) and the new Department of Homeland Security (DHS), have tended to defer to agencies with the most nuclear expertise, such as the Nuclear Regulatory Commission (NRC) and the Department of Energy (DOE). Unfortunately, these agencies are also those closest to the nuclear industry, whose primary motivation in today's competitive electricity market is to keep operating costs, including security costs, as low as possible, no matter how grave the actual threat environment. As a result, the government has been slow to address the terrorist threat to spent fuel in a systematic and consistent manner.

The September 11 disasters graphically demonstrated the vulnerability of the critical infrastructure in the United States to terrorist attack. The security of nuclear power plants and nuclear waste storage sites naturally became a focus of increased public concern. Long before September 11, observers had tried to draw attention to the inadequacies of NRC's security regulations, especially in view of the rapidly evolving capabilities of terrorist organizations. However, in the absence of credible threats against the US infrastructure, these concerns failed to capture the attention of the media, the public, or elected officials. As a result, little was done to address the problem. In fact, an industry-led effort was underway before the attacks to weaken NRC's security requirements.

After September 11, the public perception of the terrorist threat drastically --- and justifiably --- increased. While some parties took advantage of heightened public awareness to prompt authorities to address vulnerabilities that threatened public safety, others exploited the attacks to advance their own agendas. Nuclear waste became a political football in this arena.

For the first time, the Department of Energy cited the security risks of on-site spent fuel storage as a justification for proceeding with quick approval of the proposed geologic repository at Yucca Mountain in Nevada. In a January 2002 letter to the governor of Nevada, DOE Secretary Spencer Abraham wrote that "a repository is important to our national security. We must advance our non-proliferation goals by providing a secure place to dispose of any spent fuel … we should consolidate the nuclear wastes to enhance protection against terrorist attacks by moving them to one underground location that is far from population centers."

At the opposite pole stood the state of Nevada and its allies along prospective spent fuel transport routes, who had been highlighting for years the risks posed by sabotage of spent fuel shipments in their campaign against the Yucca Mountain repository. The events of

September 11 appeared to lend greater credence to their concerns. Today these groups argue that greater protection of the public would be achieved by storing spent fuel more securely at reactor sites than by shipping it across vast distances to a repository.

DOE dismisses the claims of Yucca Mountain opponents as "transportation scare tactics." However, DOE has not explained why the public should not worry about the vulnerability of spent fuel in transit to terrorist attacks, if it indeed poses such great risks when standing still at reactor sites. DOE's newfound concern about the risks of at-reactor spent fuel storage also rings false when one considers that it has not publicly lent its support to those members of the public who have been calling on NRC to harden spent fuel storage sites in the wake of the September 11 attacks. Security upgrades at reactor sites would be needed even if all nuclear power plants immediately shut down and Yucca Mountain were already open for business, since large quantities of spent fuel would be stuck at their current locations for decades.

Where exactly does the truth lie in this debate? There is certainly cause for concern for the security of spent fuel stored at reactor sites. In the United States, the policy of reracking spent fuel pools to accommodate spent fuel at densities well beyond that which the pools' original design capacity has led to risky storage configurations that are potentially susceptible to catastrophic zirconium fires, fuel melting and release of a significant fraction of the radionuclide inventory, in the event of a terrorist attack that causes a rapid draindown of the pool water.[1] Given that many of these sites are located near densely populated urban areas in the eastern United States, the wisdom of high-density pool storage needs to be reevaluated in light of the new threat environment. Expediting movement of spent fuel from wet pools into dry casks could go a long way toward minimizing the risk, but NRC is refusing to consider ordering such an action.

On the other hand, there are also considerable security risks associated with transporting large inventories of spent fuel from reactor sites to either centralized interim storage or to a geologic repository. It is generally more difficult to protect materials in transit from sabotage or theft than to protect materials at fixed sites. Although the radionuclide inventory of a typical spent fuel transport cask is much smaller than that of an entire spent fuel pool, it can contain substantial quantities of cesium-137 and other long-lived radioisotopes. Knowledgeable terrorists could effectively utilize such a cask as a massive "dirty bomb" by explosively breaching it in an urban area.[2] And to the extent that terrorists are more likely to be successful in stealing spent fuel by intercepting a shipment rather than staging a violent raid on a storage facility, a large-scale transport campaign could significantly increase the risk of terrorists obtaining enough plutonium in spent fuel for a nuclear explosive device, should they possess a crude reprocessing capability.

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[1] R. Alvarez, J. Beyea, K. Janberg, J. Kang, E. Lyman, A. Macfarlane, G. Thompson and F. von Hippel, "Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States," *Science & Global Security* **11** (2003) 1-60. This article, the NRC's review and the authors' rebuttal can be found at http://www.princeton.edu/~globsec/people/fvhippel_spentfuel.html

[2] E. Lyman, "A Critique of Physical Protection Standards for Transport of Irradiated Materials," Proceedings of the 40th Annual Meeting of the Institute of Nuclear Materials Management, Phoenix, AZ, July 1999.

It is clear that equitably balancing the risks and benefits of indefinite on-site storage of spent fuel versus transport to a more remote location is an extremely difficult task. As illustrated above, the large uncertainties involved have provided plenty of room for interpretation among the various parties. To avoid the growing stalemate in the United States on the nuclear waste security issue, Canada must ensure that the best technical information is made available to all stakeholders, to the extent possible within the confines of justifiable security restrictions. Areas of uncertainty and subjectivity must be clearly delineated. Otherwise, there will be little chance that a resolution will be found for the fundamental tension that exists between individuals in communities near at-reactor storage sites, along potential spent fuel transport routes, and near proposed centralized storage or geologic repository sites.

The security risks posed by spent fuel in storage and transit will remain unacceptably high until sufficient resources are made available to ensure a level of protection sufficient to protect against emerging terrorist threats. The cost to provide the level of security needed to adequately protect the public may well be greater than the amount that the nuclear industry is willing to spend. If that is the case, then a public dialogue is necessary to determine the degree to which Canadians are willing to subsidize the continued operation of nuclear power plants and production of spent fuel in an era where the threat of catastrophic terrorism is likely only to increase.