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ON BEHALF OF THE
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ON
TRANSPORTATION OF SPENT FUEL RODS TO THE
PROPOSED YUCCA MOUNTAIN STORAGE FACILITY

BEFORE THE
SUBCOMMITTEES ON HIGHWAYS AND TRANSIT AND
RAILROADS
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
UNITED STATES HOUSE OF REPRESENTATIVES

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Good morning Mr. Chairman and the distinguished members of the Subcommittees gathered here today. As a scholar of terrorism tactics related to the transportation of radioactive waste materials, I appreciate the opportunity to appear before you today to discuss the evolving nature of the security and safety risks involved in the shipment of highly radioactive waste materials.

This testimony will provide information on several transportation related issues relative to the vulnerability of the proposed shipments of nuclear waste to the Yucca Mountain facility and possible attacks by terrorists. These shipments will transpire by road, rail, and barge if the Yucca Mountain facility were to be licensed for use by the Nuclear Regulatory Commission [NRC]. Once that process would be complete, then the Department of Energy [DOE] would have to finalize the planning for its construction before Yucca Mountain would become ready to accept shipments from around the country. The discussion presented herein addresses several significant issues relative to the regulation and safety of the proposed massive transportation effort involving highly radioactive materials.

Nature of the Problem

The first step in addressing the issue of terrorism risk against spent nuclear fuel [SNF] shipments is to recognize the nature of the problem. What is being transported sounds benign when it is termed "waste products" or "spent fuel rods," but we should recognize these cargos for what they could become: Potential weapons of mass contamination. Each of these shipments represent a huge inventory of highly radioactive materials and if released during transit, they would create: potentially massive public health impacts; cascading response demands on the emergency response infrastructure of the United States; severe impacts on the social fabric of this country; economic impacts that could dwarf those seen from the September 11, 2001 attacks; and severe stigmatization of communities where the release occurs.

A release from one of these shipments has the potential to contaminate the adjacent transportation infrastructure as well as large areas of the local community where an incident occurs. To avoid long-term dislocation of vital services would require immediate intervention, extensive environmental remediation, and

would ultimately require an unprecedented national response. Continued access and use of the affected transportation infrastructure would be disrupted for an extensive period of time and cause intermediate term disruption in our highly integrated national transportation system until such time as these radioactive hazards were mitigated.

The deliberate release of the radioactive cargo would constitute a radiological dispersion incident. Radiological terrorism encompasses two categories of weapons. The first category is bombs that create a nuclear reaction and involve a massive explosion, radiation dispersion, and widespread destruction of property. The materials in SNF cargos will not be equal to these types of weapons in terms of effects. The second category is radiological dispersion devices. These weapons do not necessarily have the potential for causing a chain reaction, but nevertheless have the ability to create a mass contamination event. It is this latter category that concerns us today.

For radiological dispersion to occur, two components are needed: (1) explosives or a physical release mechanism and (2) radioactive source materials. Logic dictates that the larger the inventory of source materials and the more dangerous the inventory of radionuclides, the greater the impact of dispersion into the environment. SNF shipments clearly have the potential for use as radiological dispersion devices under certain circumstances. These circumstances depend on a variety of factors and five relative topics related to these are noted in the discussion below.

The transportation effort as proposed will ensure a target rich environment wherein a terrorist could pick and chose the time and place for an attack.

Potential shipment saboteurs and attackers will be presented with what is called a “target rich” environment. This tactically

advantageous environment will provide them the opportunity to plan and execute a terrorist attack, using features of the proposed transportation effort to their advantage.

The overall time and effort necessary to transport the materials across the country is one such advantage. Because of the choice of a single centralized repository that is located far from the majority of production sites, these shipments will need to travel long distances across road, rails, and waterways. Such sustained transportation efforts over great distances will produce easily identifiable and predictable shipment characteristics such as set times of day when a shipment is most likely to pass an attack location and large numbers of shipments along identifiable routes, from which an adversary could pick and choose its target. The numbers of shipments (be they in the form of the DOE's mostly rail plan, the mixed rail/highway plan, or the primary highway shipment plan) will increase the likelihood of an adversary being able to acquire the target (shipment) and thereafter execute an attack on either a highway, railway, or waterway shipment.

Massive numbers of shipments, predictable schedules, identifiable cargos, and the overall length of the transportation routes add additional risks to the proposed Yucca Mountain program. The additional miles equal many more insecure areas for the transportation effort and lower the potential for appropriate defenses that can be planned and executed. Moving these materials out of their current safe and secure locations decreases the potential defense options available to counterterrorism planners since the ability to secure tens of thousands of miles of roadways, railways, and waterways at the same level as a power plant would be impossible to achieve under current plans.

Recognizable and readily identifiable routes for transportation of these wastes are codified in regulations, bounded by shipment
vehicle limitations, and the options available for shipment routes are limited by distance and geography.

Critical geographically disadvantageous locations are impossible to avoid during transportation efforts. These include such transportation infrastructure components as tunnels; bridges; trusses; steep grades; co-existent pipelines carrying petroleum products; multiple use transportation corridors (e.g. highway, rail routes, and waterways that are side by side); and others. Securing all of these locations will be necessary to insure that the shipments themselves do not encourage an attack simply because of their proximity to critical and usable (from the attackers perspective) infrastructure.

NRC, DOE, and other agencies have regulations that dictate the avoidance of highly populated areas wherever possible, control the access to certain transportation infrastructure features, and otherwise may limit the safest and most secure options available for transporting SNF. These regulations convey unrealistic assumptions about SNF transportation risks when considering the location of production sites and the many jurisdictions that the cargos must unavoidably traverse. As population densities, traffic densities, and other growth factors increase over the lifespan of the program, risks to population centers and infrastructure will also increase.

Transportation targets are different than fixed targets; they are much more difficult to defend. As such, they will need appropriate levels of security relative to their different threat profiles. Nevada argues that these shipments are more in need

of security than has been planned and anticipated for by the NRC, DOE, and other agencies.

For example, certain characteristics of the vehicles themselves present a different risk profile than would a fixed target. Shipment vehicles will contain varying amounts of flammable fuel, will pass within close proximity to fuel bearing or potentially explosive cargos on other vehicles, and/or require refueling at locations wherein a significant inventory of explosive fuel is stored. These factors and many others make the shipments more vulnerable to an attack based on their interaction with these co-existent features.

If on-board and co-existent fuels were to be used to create a multiple layered incident scene, the actual trucks and/or trains could create a larger on-scene fire hazard and increase the dispersion of a radioactive plume. The bottom line is that such fuels could be used as part of the release mechanism for the radioactive cargos and increases the effect of a breach.

Fuel is just one of many hazards faced when transporting nuclear wastes from safe, secure facilities and across the transportation infrastructure. While these shipments would represent a lower level of overall releasable inventory than an attack on a nuclear power plant, the chances of a breach on insecure roadways, difficult to secure rail corridors, and yet-to-be studied hazards associated with the use of waterways, make shipments more likely attack targets than a containment vessel at a nuclear power plant.

There are several varieties of terrorism related attack tactics with a higher-than-anticipated probability of breaching shipping casks.

The attack scenarios presented below are composites of more detailed work presented by Nevada and academics over the years. They represent several varieties of tactics that have yet to be

studied in any meaningful way as real and probable transportation events during the lifespan of the proposed shipment effort.

The first is a capture and breach scenario. If the transportation vehicle were to be captured, placed in an immobile state by any number of means, or once acquired it was able to be moved at will by the terrorists, it would be susceptible to the application of explosives and/or a human engineered breach. Success at fielding this tactic would depend on how long the incident response would take and how effective the terrorists could be at holding off local emergency responders. Thus, the cargo could become a radiological dispersion device if the attackers where to breach cargo shielding and release the radioactive contents into the environment. This scenario may represent one variety of a maximum severe incident and could result in a moderate release of radioactive cargo not anticipated by current regulations and/or cask design specifications.

A transportation infrastructure attack scenario would likewise represent a risk to these cargos. The huge variety of topography and transportation infrastructure components that would be traversed in the nationwide shipment of SNF presents unique challenges to safety and security planners. For example, the deliberate attack on a shipment in a tunnel could expose the cargo to risks of an impact breach, a crush breach, and/or a fire related incident sufficient to cause a failure of the controls engineered into cask designs. This scenario may represent a maximum severe incident and could potentially result in a moderate release of radioactive cargo not anticipated by current regulations and/or cask design specifications.

The last scenario that should be considered is that of a remote attack using current generation weapons. If the transportation vehicle and its cargo were to become vulnerable to line of sight attack tactics and weapons (e.g., readily available anti-tank

missiles, stolen military amour piercing weapons, and/or one of an emerging generation of recoilless rifle munitions with sufficient penetrating power) an adversary could use existing regulatory protocols like the disabling device on these vehicles, and/or in conjunction with geographically disadvantageous locations, to attack the vehicle from a distance of upwards of 3000 meters. This scenario may represent a maximum severe incident and could potentially realize a massive release of the radioactive cargo not anticipated by current regulations and/or cask design specifications.

NRC and DOE regulatory and management cultures seem unwilling to adopt a more proactive stance on counter terrorism planning, attacks prevention, and risk mitigation.

Nevada and others have consistently made suggestions on necessary security and safety regulations for these radioactive shipments. These comments have been directed to both the NRC and DOE but as of now they have not been addressed. These suggestions predate the recent attacks in New York and Washington and include:

1. A demand not to reduce security for the shipments of highly radioactive materials as was proposed by a modification in NRC regulations.
2. The absolute necessity of using dedicated trains for rail shipments to allow for more robust security and fewer chances for co-existent attacks.
3. Modifications in design threat basis to account for the possibility of multiple attackers using advanced weapons, asymmetrical tactics and the potential for multiple simultaneous attacks.

4. Changes in regulations to better account for the potential of group suicide attacks on the shipments of radioactive wastes.
5. The absolute need for full scale testing of shipment containers that are going to be used in the actual shipment effort and not outdated casks.

Nevada's intent in suggesting these regulatory changes is to reduce the risk of the overall transportation effort, minimize the potential of a terrorist attack, and to lower the outcomes if one where to transpire.

After September 11, 2001, Nevada and other researchers began to build upon these preexisting proposals in an effort to stimulate better planning and management of the transportation effort given the new realities of a world where terrorism can create such catastrophic consequences. These emerging suggestions include potential attack scenarios wherein asymmetrical tactics are used to breach the integrity of the casks and/or create a transportation accident scene that increases the likelihood of a radioactive release. Asymmetrical terrorist tactics would employ heretofore undocumented methods of terror, perhaps coupled with time tested terrorist tactics, to accomplish a large-scale incident. For example, the September 11 attacks incorporated very traditional tactics like bombing and hostage taking, with new tactics like planned group suicide, multiple targets, and simultaneous attack sites.

Examples of several asymmetrical tactics that could be employed against waste shipments include:

1. Theft of a petroleum transportation vehicle and use thereafter as a mobile bomb device against a truck or rail shipment.
2. Use of an explosive device against a co-existent rail shipment of volatile chemicals that would act as an attack device for a mixed car rail shipment.
3. Use of falsified transportation credentials or insider knowledge to gain access to shipments with the intent to create a radiological dispersion.
4. The taking hostages and using them as human shields until the final attack consequences are achieved.
5. The use of large numbers of attackers as part of a capture and radiological release scenario.

One severely underdeveloped area of counterterrorism analysis is the emerging terrorist paradigm wherein the motivation of the attackers is not to promote change within the political structure of the country under attack but rather to relay a message of aggression and defiance to other countries, cultures or sub-populations therein. For example, some terrorist experts and the NRC/DOE have generally considered suicide attacks against shipments a low level priority since the use of radioactive materials as a weapon would create heretofore unacceptable consequences for the individual doing the attack. September 11, 2001 demonstrated the outdated nature of this assumption.

The prohibition against large-scale attacks in the old "rules of terrorism" have changed, and regulations, procedures, and indeed the very basis for a transportation risk assessment need to be reexamined in light of the events of September 11th, 2001. The typical cost-benefit risk assessment analysis is clearly challenged

by the new and emerging reality of terrorism, a reality where political or social gain is not the ultimate goal of an attack.

We do it all the time, why be concerned now?

While quantities of radioactive materials are transported everyday around this country and the world, the amount of radiation in the shipments to the proposed Yucca Mountain repository is many times greater that that contained in these mostly lower-level sources and generally smaller cargoes. In addition, the Yucca Mountain shipping campaign will be unprecedented in a number of important ways. More shipments of SNF will occur in the first full year of repository operations than have been made nationwide during the past 40 years. Not only will the numbers of shipments drastically increase, but also the distances from the production sites, mostly in the Eastern United States, will be substantially greater and affect far larger geographical areas than the historical shipments offered as exemplars by the NRC, DOE, and the nuclear industry.

This committee should recognize that the proposed shipments to Yucca Mountain could average more than two thousand miles per shipment. The truck shipments alone will affect 703 different counties with a combined population of over 123 million.

These shipments will also represent a large-scale, high profile federal program. As such, they have symbolic value to terrorist groups opposed to the U.S. government. A successful attack could be publicized as a blow against the military or business related technological dominance of the United States. In addition to the threat from foreign terrorist organizations like al-Qeada, specific types of adversaries could include domestic groups opposed to a particular federal action like the decommissioning of nuclear weapons or nuclear power in general,violent protesters opposed to the SNF transportation effort who wished to create a situation

wherein the shippers and/or regulators would be embarrassed, and a whole plethora of localized shipment specific adversaries.

Conclusion

While many of the examples presented today were developed over the last 20 or so years, they are clearly sharpened and made more critical by the events of September 11, 2001 and other incidents that transpired directly thereafter. These tragic experiences serve to heighten the urgency for transportation planners and decision makers to more effectively account for the risks associated with moving massive quantities of highly radioactive materials from their existing safe and secure locations, across the nation's vulnerable transportation infrastructure, to a facility thousands of miles away from production or storage sites.

The proposed effort to transport SNF to Yucca Mountain will expose the cargoes and public to risks that are not adequately addressed within regulatory structures, including the potential for highly radioactive waste shipments to be used as weapons of mass victimization. Transportation terrorism is a very real threat. Shipments of SNF pose particular challenges because of their unique symbolic value as a targets, because of the shipment frequency and predictability, and because we are facing a new variety of terrorist who would think nothing of committing what they would consider an act of altruistic suicide against highly radioactive cargos.

The bottom line is that there must be adequate consideration given to the risks posed by massive numbers of radioactive waste shipments. Disturbingly, this has not been the case, even though Congress is being asked to approve a plan that would remove SNF from safe, secure fixed storage locations and move it across the country via less secure and potentially vulnerable highways, railroads, and waterways. We must recognize that the failure to

address terrorism concerns could become a human health, transportation infrastructure, social, and political disaster.

Before taking any action, Congress should insist that a robust and inclusive assessment of the terrorist threat be undertaken. Such an assessment should take into account the changing nature of the terrorism threat, the extraordinary and unprecedented length of time necessary to transfer these materials from production sites to a geologic repository, the enormous number of shipments needed to make this transfer of risk, and the physical characteristics of radionuclides in the cargos. The nation stands to make a mistake of tremendous proportions and potentially devastating consequences if politically expedient action is permitted to supplant sound policy and decision making with respect to the critical issue of terrorism against radiological shipments.

Mr. Chairman and distinguished members of the committee, thank you again for the attention you are giving these issues.