

Prepared Statement of
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Approving the Site at Yucca Mountain, Nevada, for the Development
of a Repository for the Disposal of High-level Radioactive Waste
and Spent Nuclear Fuel, Pursuant to the
Nuclear Waste Policy Act of 1982.

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PREPARED STATEMENT OF JAMES DAVID BALLARD, PH. D.

Mr. Chairman and Members of the Committee, my name is Dr. James David Ballard. I am an Assistant Professor of Criminal Justice at Grand Valley State University in Grand Rapids, Michigan where I teach a variety of courses on terrorism, research methods, criminology, and criminal justice. I am a sociologist and my training at the University of Nevada, Las Vegas was in political sociology, deviance, and criminology.

Currently, around the world research is being done on the potential for attacks against nuclear facilities and radioactive waste shipments. I am involved in one such working group. This international effort includes a number of researchers from Stanford University, experts tied to various government agencies, and is being funded by a grant from the North Atlantic Treaty Organization [NATO].

For the last seven years, I have studied the risk of terrorism attacks on nuclear waste shipments to the proposed Yucca Mountain storage facility. In particular, I study the changing nature of terrorism and the terrorist tactics that could be employed against nuclear waste shipments. I appreciate the opportunity to provide this body with some information on the potential of terrorism attacks against the shipments of spent nuclear fuel [SNF] and high-level radioactive wastes [HLRW] that could be made to the proposed Yucca Mountain facility.

Introduction

Several factors are important to recognize when considering the potential of terrorism against nuclear waste shipments to the Yucca Mountain facility. The proposed shipments to the Yucca Mountain facility will come from energy, research, and defense related facilities. These shipments will traverse the roadways, rail corridors, and shipping lanes of America and require decades of effort to transfer from their existing safe and secure facilities and to the proposed repository.

This process could happen under a variety of circumstances. For example, it could start once the Yucca Mountain facility is licensed for use by the Nuclear Regulatory Commission [NRC]. If that process is completed, and the decision then passes expected legal challenges, the Department of Energy [DOE] would then have to finalize the planning for the construction of the Yucca Mountain repository, construct a huge fleet of shipment containers, and only then would the proposed facility be ready to accept shipments from around the country. Other possibilities exist, but what matters is that you have a chance to influence the eventual outcome. Understanding terrorism as a risk to these shipments may help that policy decision.

Most experts would agree that removing such highly radioactive cargoes from the confines of their existing safe and secure facilities and exposing them to the dangers inherent in the massive transportation effort necessary to move them to Nevada is not an optimal safety and security risk reduction strategy. For example, two significant and unique risks would arise when removing these cargoes from their existing facilities and

the subsequent transportation effort: Transportation accidents and in-transit terrorism attacks. The discussion that follows is focused around several of the most common questions surrounding the risk posed by these shipments with respect to in-transit terrorism attacks.

Is Terrorism a Threat to These Shipments?

When we ask the question is terrorism a threat to these shipments, the answer is a definitive yes. The attacks of September 11, 2001 demonstrated that terrorists continue to develop an interest in weapons of mass victimization and have seemingly perfected the use of asymmetrical tactics that can wreak havoc on the economic, social, and political stability of our nation with a single act of terror. Subsequent investigations of the infrastructure behind these particular attacks revealed an active interest by al Qaeda and others in the development of nuclear weapons of mass destruction and radiological weapons of mass contamination. The latter category is where the risks lie for shipments of radioactive wastes like SNF and HWRW to the proposed Yucca Mountain facility.

What is being transported sounds benign when it is labeled "waste products" or "spent fuel rods," but terrorists and counter terrorism experts recognize these cargoes for what they could become: Potential weapons of mass radiological contamination. Each of these shipments represents a huge inventory of highly radioactive materials including such cargoes as pressurized fuel assemblies, transuranic wastes, and surplus weapon grade plutonium. If these materials were to be deliberately released into the environment 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 radiological contamination based stigmatization of the communities where the release occurs.

Obviously, a human initiated release from any one of these shipments has the potential to contaminate the local community where an incident occurs with radiation. To avoid long-term national level dislocation of vital services that such an attack could induce, and to counteract potential negative human health consequences that would occur from such a deliberate exposure to these radioactive cargoes, would require immediate intervention, extensive environmental remediation, and would ultimately require an unprecedented national response equal or greater than that mounted to counteract the September 11, 2001 attacks.

Nuclear and radiological terrorism encompass two large categories of weapons. The first category is related to bombs that create a nuclear reaction and involve a massive explosion, radiation dispersion, and widespread destruction of property. The materials in SNF and HLRW cargoes will not be equal to these types of weapons in terms of overall effect, but they can be weaponized and thus fall into the second category of radiological weapons. The weaponization process using radioactive source materials like SNF and HLRW is referred to as a radiological dispersion device. The human initiated release of

these particular radioactive cargoes would constitute a potential large-scale radiological dispersion incident.

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

Why Target These Shipments and Not Other Hazardous Materials, Radioactive Cargoes, or Radioactive Sources?

Several factors would make these shipments prime targets for a terrorist attack and attract the attention of potential adversaries. These include both factors that may attract international groups and those that may inspire domestic groups to commit an act of violence against the shipment. After noting these factors, it will be argued that another more important factor has been neglected in the discussion of safety and security; that is the symbolic value of the attack against radioactive waste shipments and disposition of the cargoes thereafter.

First, it is important to recognize that these shipments might be an attractive target for international groups. They will represent an easily identifiable target, one that is predictable, and one that because of the longevity of the shipping campaign will allow for detailed planning and support from transnational sources. Because of the connection between the cargoes and our military infrastructure, there also exists the potential for retaliation attacks. Likewise, attacks on energy infrastructure have been a concern of terrorist experts for decades and were the discussion topic de jour for a recent G8 Energy Ministers meeting in Detroit. Also, anyone attacking these cargoes would be able to create an enormous economic impact by the introduction of “event risk” into the energy industry and its related commodities markets.

These and many other factors all raise the international terrorism risk profile for the agencies and industries wishing to transport shipments of highly radioactive wastes, especially on the scale proposed for the Yucca facility.

The shipments may also attract considerable attention from domestic groups willing to perpetrate violence to press their political and social agendas. These domestic terrorists could be motivated by a variety of factors. For example, they could be opposed to the forced acceptance of energy wastes into their state. Deeply held distrust of the DOE and its motives with respect to nuclear wastes may inspire individuals to commit violence against SNF and HLRW shipments.

Domestic groups could also be motivated to commit violent acts in opposition to the shipments and nuclear facilities by using a variety of tactics. One example that is

illustrative of the potential for attacks was a 1972 hijack incident where the perpetrator threatened to crash an airplane into a research facility at Oak Ridge, Tennessee.

Additionally, potential domestic adversaries could include radical groups similar in philosophy to the Earth First and Sagebrush Rebellion movements. Such groups, and those who would emerge over the lifespan of the proposed project, could represent as large a threat as a well-financed international terrorist organization.

Domestic groups may have different motives than international terrorists, but we must recognize that America is not immune to internal attacks, even potential devastating attacks using mass radiological contamination tactics. After all, we have already witnessed a 1986 domestic terrorist incident where a group was willing to remove a rail section in front of a train carrying SNF at a location just outside of Minneapolis, Minnesota. While not successful, this was an organized attempt to derail the radioactive cargo and draw attention to the groups' opposition to the shipment of nuclear wastes.

Make no mistake, interest in radiological terrorism is not only on the terrorists' radar, but should be on policy makers' radar as well, since counter terrorist experts recognize that the future is not without serious risk of such attacks. While noting which groups could mount an attack is one way to begin to identify the risks these shipments pose, this exercise misses one of the most important aspects of why these shipments will become targets. The primary reason why SNF and HLRW shipments could become targets is their symbolic value to terrorists. The next section addresses this critical issue.

What is the Link Between Symbolic Value and Terrorism Attacks Against Nuclear Waste Shipments?

Terrorism is generally defined in terms of the tactics used in the attacks, by use of a typology of potential adversaries, and/or within the confines of criminal law. Another way of understanding terrorism is to focus on why certain targets are more attractive than others.

For example, why was the World Trade Center the target of repeated attacks? To answer that question we must understand that these buildings represented more than just steel and concrete. To the terrorists that attacked the complex in February 1993 and again in September 2001, this office and commercial complex represented American economic strength. These attacks were against the core values of this society and the financial force behind American global economic dominance. They were not merely attacks against buildings, nor were the buildings just a target for random violence. The attacks meant something and were designed to convey a message to America and the world community.

So, could an attack against SNF and HLRW shipments be seen as such a symbolic act? Absolutely. To examine this idea, it is important to note several relative features that will help in an understanding of the symbolic value of these shipments.

First, at a most basic level, we should not forget that these shipments are radioactive and the general public fears this fact. The cultural conditioning represented by such historical facts as the decades long Cold War doctrine of mutual assured destruction, and the images of mass victimization and destruction documented after the use of nuclear weapons during WW II, has contributed to a generalized and specific anxiety about radioactivity and all things nuclear.

These historical facts are coupled with a generalized public distrust of the DOE and its management of the nation's nuclear weapons arsenal, the by-products of the weaponization of the atom, and what some consider the trivializing attitude taken by the energy industry and this federal agency when it comes to the safety and security of the public health, environment, and economic well being of the nation. Critics would point out that this is, after all, the same federal agency that was responsible for unethical medical tests on humans to determine the health effects of radiation and it is the agency most responsible for the serious mismanagement of such radioactive sites as Hanford, Washington and Rocky Flats, Colorado.

Regardless of the actual health hazards posed by these shipments, any incident involving these cargoes would elicit a public response of fear, panic, and distrust of any authority figure wishing to explain the health science of radioactivity over the reality of the public perception of the risks they were exposed to during a contamination event. The symbolic value of an attack against highly radioactive waste shipments should not be underestimated, since such perceptions are very real in their adverse political, economic, and social consequences.

Secondly, the cargoes are dangerous. The DOE itself reports that truck and rail casks will carry inventories of between hundreds of thousands to millions of curies respectively. Thus, they are not only dangerous in a symbolic manner, they represent a potential weapon of mass radiological contamination. A weapon that if used would create a backlash against the continued use of nuclear power in America, a backlash against federal agencies and their efforts at transporting these materials, and a backlash against anyone in charge at the time of the attack, and responsible for protecting public health and welfare against such actions.

For example, imagine if you will how an attack, successful or not, would threaten all nuclear power and research, create an immediate stoppage of shipments and cause an extensive investigation into safety and security procedures. Additionally, it would be a publicity disaster of unimaginable proportions for those charged with the moral, legal, and ethical responsibility of protecting the public.

A proactive search for a more viable and safe alternative, like a 50 - 100 year term strategy of sheltering the wastes in place at their existing storage facilities, would allow the public to gain a semblance of acceptance for DOE actions and thus reduce the potential impact of this particular symbolic effect. The current DOE efforts to push ahead with the Yucca Mountain proposal, without completing the scientific study of the proposed repository, can only fuel fear of the DOE and increase the symbolic impact of

this type of attack. Likewise, the failure by the NRC and DOE to adjust to the new reality of terrorism may have an equal or greater devastating consequence.

Lastly, the whole shipment effort has the potential to create a mass counter culture based revolutionary opposition movement similar to that seen in recent years regarding the negative effects of globalization. Here, public safety and security experts saw the banding together of dissimilar groups like anarchists, labor advocates, and human rights activists to symbolically fight what they may consider the negative aspects of globalization.

This is an illustrative model for future large-scale opposition groups who will oppose the shipments to the proposed Yucca facility. The result of this social development is that America will be facing what has already transpired in Germany and other industrial nations: Widespread anti nuclear protests from well-organized and highly motivated protest groups. These shipments have the symbolic value of sparking such protests and these in turn increase the risks of an attack when transporting the materials, not necessarily by the groups themselves, but by others and within the context of their protests.

The symbolic nature of terrorism is multifaceted and difficult to codify into risk assessment methodologies, especially when those methods do not account for asymmetrical situations that could lead to an increased risk of an attack. Likewise, it is difficult to assess the risk of attacks when the DOE and NRC consider few, if any, non-traditional terrorist tactics that may form the basis of a human initiated mass contamination event using radioactive wastes. The connection between symbolic events and waste shipments is examined in the next section of this testimony.

What Types of Symbolic or Everyday Situations Could be Envisioned and Could They be a Threat to Shipment Security?

One symbolic issue not necessarily recognized in shipment planning, and that is subject to change over time as America becomes more populated, is that of geographic location. The attack location plays an important symbolic part in the identification and assessment of situational terrorism risks for SNF and HLRW shipments from the existing production and storage sites and to the proposed repository. Examples include:

1. Highly populated urban locations, especially large downtown office buildings, shopping districts, hotel complexes, convention centers, and specialized tourism areas are a different area of concern. These locations are different from other populated areas since urban attacks pose a different level of logistical challenge to the first responder community. Urban attacks may also create an initial higher public relations profile for the terrorist cause because of their proximity to a more intense concentration of media outlets.
2. Locations of special events such as the Olympics, the Super Bowl, and other major sporting events, major international trade shows or conventions, and national political party conventions are examples of other types of situational

- events that will offer attractive symbolic target opportunities. These events have a symbolic value that could potentially draw an adversary because of the potential media coverage and/or because of the adversary's ability to communicate a message by attacking a particular type of event.
3. Suburban locations near residences and difficult-to-evacuate facilities such as schools, hospitals, airports, shopping malls, industrial plants, amusement parks, sports stadiums, race tracks, and concert halls. The symbolic value of these targets and the motivation to perpetrate an attack in close proximity to these types of areas differs from that found in other areas. For example, a terrorist could choose to perpetrate an attack on these geographic areas to create a highly disruptive mass evacuation event.
 4. Rural locations near environmentally sensitive activities and resources such as farms, ranches, surface and underground water supplies, resorts, wildlife refuges, parks, and other public recreation facilities. Such areas have a different symbolic factor than that posed by other geographic areas, and the aggravated use of that value depends on the motives of the adversary.

While location and situational factors are important, the outcome of a human initiated mass radiological contamination event can vary, depending on a number of variables. These factors could include the motivation of the adversary, the type of attack, the weaponry used, and other salient variables. Proactive terrorist risk assessment methodologies would account for such variations in tactics and recognize the variability of the symbolic value a terrorist could attach to such tactical considerations.

For example, when considering these shipments and the contemporary terrorism threat potential, it is important to consider a range of terrorist attack outcomes such as:

1. Attacks designed to induce a breach of the cask where the contents are damaged, where the various radioactive cargoes to be transported are released into the environment, and where the effects of radiation emissions as a result of the loss of shielding could be a danger to human health.
2. Attacks can also yield a result where the cask is damaged, but with no large-scale release of radioactive materials. This could result in a measurable radiation emission from loss of shielding, but not a radiological dispersion equal to that from a full breach.
3. An attack could also yield a cask, the transportation vehicle, or the transportation infrastructure being damaged during the attack, but because of the engineered controls and physical design of the cask, the shipment would suffer no release and no loss of shielding. The recovery effort for such an incident would be delicate since there would exist a potential loss of containment and/or shielding, but in general this would be a less risky situation than that posed by a full or partial breach of the shielding.
4. The fourth category is where the cask is undamaged and the attack fails to yield any chance, or actuality, of a radiological dispersion. Under this scenario the actual attempt itself would have symbolic ramifications as noted above.

Considering the range of outcomes of an attack against these shipments by use of such a typology is a critical omission in current analytical and methodological assessment models being used by the DOE, NRC, and various agencies and contractors who are assessing the security of these shipments. In the next section specific types of attack scenarios are discussed to help illustrate the evolving nature of the vulnerability of these shipments and how transportation planners who focus only on past experiences with shipments, and not on the future risk realities that these shipments will face, underestimate the impact of the changing face of terrorism.

What Types of Attacks are Viable Threats Against These Shipments?

The attack scenarios presented below are composites of more detailed work presented by Nevada and various academic experts from around the world. They represent several of the many varieties of in-transit terrorism tactics that have yet to be studied in any meaningful way as very real and probable transportation events during the lifespan of the proposed shipment effort. They also represent one way to understand the risks these shipments pose, since they are exemplars of asymmetrical tactics not addressed by DOE/NRC regulation and/or security practice in the American radioactive waste transportation industry.

The first is a capture and breach scenario. If the transportation vehicle and cargo were to be captured and placed in an immobile state by any number of means, it would be susceptible to the application of explosives and/or a human engineered breach.

Traditionally, most regulatory and security tactics focus on denial of the opportunity to capture and transport the radioactive cargoes thereafter, but this is an altogether different tactic and requires different responses.

Success by the terrorists at fielding a capture and breach 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, depending on their success, the cargo could become a radiological dispersion device if the attackers were to breach cargo shielding and release the radioactive contents into the environment wherever the location of the incident.

Several relative capture and breach factors not currently anticipated, or underestimated, by waste shipment risk analysis and security practice, include the presence of pressurized cargoes and the potential radiological dispersion effect of internal cask gasses, the preexisting physical degradation of the fuel pellets in SNF cargoes that could increase the amount of respiratable particles subject to dispersion, and the potential to further degrade the integrity of the cargoes as a result of a co-existent fire resulting from the terrorist attack, and thus increasing the radioactive dispersion plume.

The capture and breach scenario may represent one variety of a maximum severe incident and could result in a release of radioactive cargo not anticipated by current regulations

and/or cask design specifications. Compounding the analysis of this scenario would be such variables as the type of cargoes, the preexisting integrity of the cargoes, and the potential for a co-existent fire that may increase the distribution of the plume after an incident would transpire.

A transportation infrastructure attack scenario would likewise represent a risk to these cargoes. The huge variety of topography, and the enormous range of infrastructure components that would be traversed in the nationwide shipment of SNF and HLRW present unique challenges to Yucca Mountain transportation safety and security planners. For example, a deliberate collapse attack on a radioactive waste 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 the physical design of the casks that would eventually be used to move these cargoes. Likewise, an attack that took place on a bridge and in proximity to populated areas (e.g., the Hudson, Delaware, etc.) may also pose unique security challenges.

The transportation infrastructure breach is likewise a type of asymmetrical scenario that may represent a maximum severe incident and could potentially result in a release of radioactive cargo not anticipated by current regulations and/or cask design specifications.

Another scenario example 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 or direct attack tactics and weapons (e.g., readily available anti-tank missiles, stolen military armor piercing weapons, and/or one of an emerging generation of 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 isolate the moving target, fix that target, and attack the vehicle from a distance of upwards of 3000 meters.

Remote attacks using such weapons as the Milan or TOW II missiles are a type of scenario that may represent a maximum severe incident and could potentially realize a release of the radioactive cargo not anticipated by current regulations and/or cask design specifications. This type of attack scenario will evolve over time and as increasingly more sophisticated weapons become available on the black market.

Why Repository Shipments are More Vulnerable to Attack Than Fixed Site Locations.

Once repository shipments begin, 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 shipments will not be as secure as they would be if stored at nuclear power plants or DOE facilities, since it would be impossible to recreate the same level of safety and security used in these facilities. In fact, these waste shipments will be more vulnerable than if they were left where they

currently are. They will become a symbolic target, face a variety of adversaries both foreign and domestic, and have the potential to be used as weapons of mass radiological contamination.

The overall time and effort necessary to transport the materials across the country is an advantage to terrorists. The choice of a single centralized repository that is located far from the majority of production sites is another advantage, since these shipments will need to travel long distances. Such sustained transportation efforts 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 adversaries could pick and choose their targets.

Such a massive shipment effort also affords the terrorist multiple and simultaneous attack opportunities. After September 11, 2001 it is hard to disregard the potential for large-scale suicide based terrorist attacks transpiring in different locations at the same time and focused on the same type of symbolic 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 one or more of the many highway, railway, or waterway shipments that will transpire.

Massive numbers of shipments, predictable schedules, identifiable cargoes, and the overall length of the transportation routes, are all factors that add additional risks to the proposed Yucca Mountain program. The additional miles equal many more insecure areas and lower the potential for appropriate security 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 counter terrorism planners, since the ability to secure tens of thousands of miles of roadways, railways, and waterways at the same level as that available at a power plant would be nearly impossible to achieve.

The policy alternative available to you today is far easier and more logical than adding more targets for terrorists to attack across the span of America's transportation infrastructure. From a strictly security and safety standpoint, these materials are better off where they sit, behind the security of walls and fences, protected by trained and professional plant security, and secured by regulations and procedures that have been designed to protect fixed site locations where nuclear wastes are stored.

If allowed to be sheltered in place at those facilities for 50 to 100 years, these wastes will become less and less toxic. That means that their radioactive inventory will become less of a risk to move, and the symbolic value of an attack will be reduced. We are in an enduring period of threat by terrorists and since this nation will not soon be abandoning its use of nuclear energy, allowing these cargoes to be sheltered in place is a viable alternative.

Concluding Remarks

Terrorism is a viable threat to nuclear waste shipments and the engineered controls put into the shipment casks are not equal to the challenge of asymmetrical tactics and motivated adversaries willing to commit what they consider altruistic suicide in the name of a cause. Current regulations, practice, and engineering do not account for the potential of 21st century terrorism and emerging modifications in terrorism tactics and philosophy.

Terrorism is changing, and to counteract the enduring threat posed to our way of life, we must reconsider our existing and future tactics and security arrangements. Until a safe and secure transportation plan capable of protecting the public interest can not only be articulated but battle tested, a plan that accounts for the radical change in terrorism illustrated by the September 11, 2001 attacks, we should stop the forward movement of this risky process.

Without due consideration and contingencies for the emerging asymmetrical terrorism tactics, it is folly to proceed with the Yucca Mountain project. Likewise, allowing the DOE and NRC to proceed without due consideration of the actual risks posed by terrorism is tantamount to endorsing bureaucratic indifference of unimaginable consequences.

I urge this body to solicit testimony not only on the historical safety and security records of these agencies, but to seek out the actual plans that have been developed to face the world we live in today, a world where large groups of well trained and highly motivated adversaries are willing to commit mass suicide to achieve an objective. A world where the unwritten prohibitions against mass murder by terrorist attack has not only been replaced, but what has been embraced in its place is a world where the terrorists are rewarded for mass victimization.

While no assurances can be made for the future, one thing is certain -- if we offer an attractive target, someone will make an attempt to attack it. Do not allow the nation's nuclear waste products to become the golden carrot for would be terrorists. Nuclear waste shipments will be targets and unlike other targets, these shipments will have sufficient symbolic value to attract well-motivated and dangerous adversaries. Do not give them the easy opportunity to prove us unprepared once again.

Mr. Chairman and Members of the Committee, thank you for the opportunity to testify and answer questions today.