

Technical Basis for the Transportation of Spent Nuclear Fuel

A The Objective of this Rulemaking

This technical basis is intended to address enhanced security requirements that apply during the transportation of spent nuclear fuel (SNF) and to make them generically applicable to all licensees by adding them to the *Code of Federal Regulations* (CFR). The staff based the recommendations put forward in this technical basis on (1) the security concepts issued in orders since the events September 11, 2001; (2) consideration of portions of the State of Nevada's Petition for Rulemaking (PRM-73-10); (3) information gathered by staff during the implementation and inspection of the past orders; and (4) insights since the events of September 11, 2001. They are intended to increase the protection of people and the environment against the malevolent use of SNF by further reducing the risk of radiological sabotage of spent fuel shipments and by facilitating the swift identification and recovery of spent fuel shipments that may have come under the control of an adversary.

The U.S. Nuclear Regulatory Commission's (NRC) Office of Nuclear Security and Incident Response anticipates no significant legal or policy issues with this rulemaking.

B. Background on Why the Current Regulation is Insufficient

Although the NRC has long participated in efforts to address the security of SNF during transport, the events of September 11, 2001, further heightened concerns about the use of SNF in a malevolent act.

Commission regulations in Title 10, Section 73.37, "Requirements for Physical Protection of Irradiated Reactor Fuel in Transit," of the *Code of Federal Regulations* (10 CFR 73.37) require licensees to put in place a physical protection system for shipments that meets the objectives to (1) minimize the possibilities for radiological sabotage of spent fuel shipments especially within heavily populated areas and (2) facilitate the location and recovery of SNF shipments that may have come under the control of unauthorized persons. Furthermore, 10 CFR 73.37 puts in place requirements that (1) provide for the early detection and assessment of attempts to gain unauthorized access to, or control over, spent fuel shipments, (2) provide for notification to the appropriate response forces of any sabotage events, and (3) impede attempts at radiological sabotage of SNF shipments in heavily populated areas or attempts to illicitly move such shipments into heavily populated areas. Commission regulations in 10 CFR 73.72, "Requirement for Advance Notice of Shipment of Formula Quantities of Strategic Special Nuclear Material, Special Nuclear Material of Moderate Strategic Significance, or Irradiated Reactor Fuel" require licensees to notify the NRC in advance about shipments of SNF.

Commission regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," establish requirements for packages used to transport SNF. Further Commission regulations in 10 CFR 71.97, "Advance Notification of Shipment of Irradiated Reactor Fuel and Nuclear Waste" require licensees to notify in advance the Governor of a State, or the Governor's designee, about shipments of irradiated reactor fuel¹ and highway route controlled quantity² (HRCQ) of radioactive materials passing through the boundaries of his or her State.

¹ The requirements of 10 CFR 71.97 apply to shipments of irradiated fuel in "quantities less than that subject to the advance notification requirements of 10 CFR 73.37(f)."

² HRCQ applies when the contents of a package exceed the following: (1) 3,000 times the A1 value as specified in Table A-1 of 10 CFR Part 71 for special form material, (2) 3,000 times the A2 value as specified in Table A-2 of 10 CFR Part 71 for normal form radioactive material, or (3) 1,000 TBq (27,000 Ci).

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After the attacks of September 11, 2001, the Commission³ determined that additional security measures should be put in place during the transport of SNF and that current security regulations should be enhanced to further protect SNF during transport from malevolent use. On October 3, 2002, the NRC began issuing orders to select licensees shipping SNF.⁴ Only those licensees currently shipping or expecting to ship SNF in the near future received the initial order. Since 2002, the staff issued additional orders to licensees transporting SNF when these licensees indicated their intention to ship SNF.

Prior to the NRC actions described above, the State of Nevada, by letter dated June 22, 1999, submitted a Petition for Rulemaking (PRM-73-10) requesting that the NRC initiate rulemaking to strengthen the regulations governing safeguards for shipments of SNF against sabotage and terrorism. The State of Nevada is a corridor state for SNF shipments, and has been a destination and origin state for SNF shipments to and from Federal research facilities. Under current law, Nevada is the potential host State for a Federal geologic repository (Yucca Mountain) and could become the ultimate destination for shipments of SNF and high-level radioactive waste. In general, the petitioner asked the NRC to (1) apply the design basis threat to shipments of SNF, (2) amend the definition of "radiological sabotage" to specifically reference SNF, (3) require shippers and carriers of SNF to identify primary and alternative routes which avoid moving SNF through heavily populated areas, (4) require armed escorts along the entire shipment route, (5) apply planning and shipment schedule requirements to SNF similar to the requirements of 10 CFR 73.26 for formula quantities of special nuclear material, (6) require dedicated trains for rail shipments of SNF, and (7) perform a comprehensive assessment of the consequences of terrorist attacks. This petition is still under consideration by the NRC. However, one particular aspect of this PRM will be addressed by this rulemaking effort. Specifically, the petitioner asked the NRC to amend the requirements of 10 CFR 73.37(c), and (d) to remove the differential in security requirements between heavily populated areas and other areas. The petitioner requested that the NRC apply the security measures, specifically the armed escort requirements, in place for heavily populated areas to the entire road or rail route of the shipment. This technical basis considers this aspect of the petition request.

The current regulations require a licensee to implement a physical protection program during the transport of SNF to minimize the risk of radiological sabotage and to ensure swift recovery following the theft or diversion of a shipment. Although these regulations provide significant security during transport, the regulations could include further enhancements in some areas. Currently, the in-transit security regulations of 10 CFR 73.37 require additional security, specifically armed escorts, in heavily populated areas but not for other areas along the route. This relaxation of security during transport in less populated areas results in a vulnerability during the shipment. An adversary could take control of the shipment in an unpopulated area and move it to a population center for a radiological sabotage event. The in-transit security regulations of 10 CFR 73.37 require notification to the NRC and appropriate agencies when a

³ The past decisions by the Commission are found in staff requirements memorandum (SRM) dated May 2, 2002 titled "Fast-Track Rulemaking to Codify Security Requirements Currently In Place for Highway Route Controlled Quantities of Radioactive Material," SRM-COMSECY-02-0026 titled "Interim Compensatory Measures, Orders and Communications Plan for Transportation of Spent Nuclear Fuel and Large Quantity Shipments of Radioactive Materials," and SRM-COMSECY-02-0044 titled "Final Interim Compensatory Measures for the Transportation of Spent Nuclear Fuel."

⁴ The identities of the licensees that received orders imposing additional security measures during transport of SNF is designated Safeguards Information (SGI) and is not releasable to the public. The order enforcement action number is also designated SGI and is redacted from public release.

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suspicious or malevolent event has taken place; however, several hours could elapse before discovery and reporting. An adversary could exploit this delay to its advantage. In situations involving the diversion or sabotage of SNF during transport, the local law enforcement agencies (LLEAs) and the Federal Bureau of Investigation should be called immediately so that they can interdict the adversaries and recover the material or take appropriate measures to mitigate radiological consequences to the public.

This technical basis recommends enhancements in the areas of preplanning and coordination of a shipment with the States through which it passes; communications among the transport, escorts, movement control centers, and LLEAs; normal and contingency procedures and training of individuals associated with the shipment; trustworthiness and reliability of individuals associated with the shipment; and physical protection consistency along the entire shipping route.

C. Role of This Rulemaking in Terms of the NRC Strategic Plan

This technical basis and proposed rulemaking support the NRC Strategic Goal of Security and strategic objectives of openness and effectiveness. The Strategic Goal of Security is to ensure adequate protection in the secure use and management of radioactive materials. The strategic outcome for the Strategic Goal of Security is to prevent any instances in which NRC-licensed materials are used domestically in a manner hostile to the United States. The security measures outlined below provide reasonable assurance that the NRC has protected the public from the use of SNF in a malevolent act.

To support the objectives of openness and effectiveness the NRC will keep stakeholders and the public informed and invite them to comment during the rulemaking process. Prior to submitting the draft rule for Commission approval, the staff recommends (1) publishing this technical basis for information on the NRC public website and (2) publishing the draft proposed rule for comment in the Federal Register and on the NRC public website, similar to the recent Geologic Repository Operations Area (GROA) rulemaking activities.

D. Technical Basis Security Requirements

The requirements specified in this technical basis establish the objectives and minimum performance standards that licensees that ship SNF or prepare SNF for shipment must meet to protect against each threat (sabotage or diversion). These requirements apply to any material transported by or offered for transportation by NRC licensees.

The objectives of these physical security requirements is to provide high assurance that shipments of SNF are not inimical to the common defense and security and do not constitute an unreasonable risk to public health and safety. The NRC will need to add sections to 10 CFR Part 73, "Physical Protection of Plants and Materials," to support this change as well as conforming changes to 10 CFR Parts 50, 70, 71, and 110.

The staff recommends the following 14 security enhancements to the existing regulations of 10 CFR Part 73 for the transportation of SNF by NRC licensees.

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- (1) In the requirements of 10 CFR 73.37 remove the distinction between heavily populated areas and other areas through which a spent fuel shipment may pass. The security requirements for heavily populated areas should apply along the entire route, including any ports of entry, regardless of mode (highway or rail). These security requirements should also be reviewed to verify minimum numbers of armed escorts and appropriate LLEA response.

The current requirements under 10 CFR 73.37 are contrary to the general performance objective of minimizing radiological sabotage events and impeding attempts to take material from one area to another. Differentiating between heavily populated areas and other areas simply provides an adversary with the location of the vulnerability during the shipment. Removing this division from the regulations provides reasonable assurance that the risk of sabotage or diversion of the material will be addressed. Removing this division would also address one concern raised in the State of Nevada's Petition for Rulemaking (PRM-73-10).

- (2) Ensure trustworthiness and reliability by performing background investigations on (a) any individual whose assigned duties provide access to SNF shipment information, (b) vehicle drivers and armed escorts for shipments, and (c) movement control center personnel. The licensee's responsibility to comply with the background investigation requirements may be satisfied by (a) an individual's current unescorted access authorization to a power reactor facility, (b) current access to Safeguards Information (SGI), (c) a current U.S. Government-issued security clearance, (d) a satisfactorily completed background investigation under an NRC-approved access authorization program, or (e) an NRC-approved credential that includes favorable adjudication by a Government agency based on fingerprinting and criminal history records check (e.g., Transportation Worker Identification Card, Commercial Drivers License with Hazardous Materials Endorsement issued after May 2005). If local law enforcement is performing armed escort duties, it would be exempt from this requirement.

This revision to the requirements of 10 CFR 73.37 provides reasonable assurance against insider assistance in the sabotage or diversion of SNF.

- (3) Immediately upon discovery of any actual, attempted or suspicious activities related to the theft or diversion of a shipment, notify the designated LLEA along the shipment route. As soon as possible after notifying the LLEA, notify the NRC Operations Center upon discovery of any actual, attempted, or suspicious activities related to the theft or diversion of a shipment. The NRC Operations Center will notify other affected States and the agency's Federal partners as required.

The existing performance objectives and general requirements of 10 CFR 73.37 and the requirements for reporting safeguards events of 10 CFR 73.71 do not require immediate notification to LLEAs and permit 1 hour to elapse before notification to the NRC of such events. This revision to the regulations of 10 CFR 73.37 provides reasonable assurance of the recovery of the material in an attempted sabotage or diversion and allows for early warning to other possible victims of a simultaneous attempt to sabotage or divert material from multiple locations.

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- (4) Develop normal and contingency licensee procedures to cover notifications; communications protocols; loss of communications; and response to actual, attempted, or suspicious activities related to the theft or diversion of a shipment. Communication protocols must include a strategy for the use of authentication and duress codes and provisions for refueling or other stops, detours, and locations where communication is expected to be temporarily lost. The licensee shall ensure that drivers and accompanying personnel, railroad personnel, port personnel and movement control center personnel are appropriately trained in and understand normal and contingency procedures.

The existing performance objectives and general requirements of 10 CFR 73.37 and the training requirements of Appendix D, "Physical Protection of Irradiated Reactor Fuel in Transit, Training Program Subject Schedule," to 10 CFR Part 73 do not require normal and contingency procedures and training of all personnel associated with the shipment. This revision to the requirements of 10 CFR 73.37 provides reasonable assurance that drivers, licensee staff, and movement control center personnel are prepared for most situations and are able to act without delay to provide notification regarding possible sabotage or diversion of the material.

- (5) Preplan and coordinate shipment information with the States through which the shipment will pass to (a) ensure minimal delays, (b) discuss the States' intention to provide law enforcement escorts, (c) arrange for sharing of positional information when requested, and (d) coordinate locations of appropriate safe havens.

The current requirements of 10 CFR 73.37 require notification to the Governor (or his designee) and local law enforcement with the States through which the shipment will pass to ensure an adequate response to an emergency or a call for assistance. This revision to the requirements of 10 CFR 73.37 ensures the State's awareness during the preplanning, coordination, and implementation phases of the shipment. In addition, 10 CFR 73.37 requires that licensees provide for advance approval of the routes used for road and rail shipments of SNF. This revision will also specifically require licensees to plan and provide safe haven information with their request for an approval of a route to ship SNF. This revision mitigates the risk of sabotage or diversion of a shipment.

- (6) In addition to the advance notification requirements of 10 CFR 73.37(b)(1) and 10 CFR 73.72(a)(4), provide for advance notification directly to the NRC Operations Center at least 2 days before the shipment departs and when the shipment is received at its intended destination for each shipment within a campaign.

The current requirements of 10 CFR 73.72 require notification 2 days before the shipment commences but not once the shipment is received. The NRC Operations Center uses the advance notification to maintain the visibility of the shipment and ensure that proper safeguards procedures are ready for use in the event of an emergency. Notifying the Operations Center that the shipment is complete allows the NRC to step down its readiness for a safeguards event.

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- (7) Remove the exemption from the advance notice requirements under 10 CFR 73.72(b) for shipments of SNF that transit public roads.

The current requirements of 10 CFR 73.72(b) exempt licensees who make a road shipment or transfer with one-way transit times of one hour or less between installations of the licensee from providing advance notification of the shipment to the NRC. This revision to 10 CFR 73.72 provides the NRC Operations Center with an awareness of any SNF shipment on a public road, even those of short duration, to facilitate its response to a safeguards emergency. This revision mitigates the risk of sabotage or diversion of a shipment. This revision would not apply to licensees moving SNF on private roads within their facilities (e.g., transfer of SNF from the spent fuel pool to the independent spent fuel storage installation).

- (8) In addition to the requirements of 10 CFR 73.37(b)(4), ensure that shipments are continuously and actively monitored by a tracking system that communicates continuous position information to a movement control center.⁵ A movement control center should provide positive confirmation of the location, status, and control over the shipment and be prepared to implement preplanned procedures in response to deviations from the authorized route or to a notification of actual, attempted, or suspicious activities related to the theft, loss, or diversion of a shipment. These procedures will include the identification of and contact information for the appropriate LLEA along the shipment route.

The current requirements of 10 CFR 73.37 include the use of a movement control center, but they do not require continuous and active monitoring of a shipment. Continuous and active monitoring of a shipment provides the means for a movement control center to immediately report an unusual occurrence that could lead to the diversion or sabotage of the material. Early notification provides for a more timely response from the LLEA, thereby reducing the risk of the use of the material for malevolent purposes. This revision to the requirements of 10 CFR 73.37 mitigates, with reasonable assurance, the risk of sabotage or diversion of the material.

- (9) Revise the requirements of 10 CFR 73.37, to establish two-way communication capabilities for the transport and escorts to contact the movement control center and local law enforcement at all times. In addition, revise the requirements of 10 CFR 73.37 to establish alternate capabilities for the transport and escorts to contact the movement control center. Alternate communications should not be subject to the same interference⁶ factors as the primary communication.

The requirements of 10 CFR 73.37(c), 10 CFR 73.37(d), and 10 CFR 73.37(e) provide for redundant communication, however, the requirements are specific (i.e. use of citizens band radio and radiotelephone or other approved NRC equivalent) and could become obsolete in the near future. Instead of specifying acceptable communications technology, the staff recommends that 10 CFR 73.37 describe the performance

⁵ A licensee could use a carrier or a third-party communications center in lieu of establishing one itself. A commercial facility must have the capabilities, necessary procedures, training, and personnel background investigations to meet the applicable requirements.

⁶ The same interference factors are defined as any two systems that rely on the same hardware or software to transmit their signal (e.g., cell tower, proprietary network).

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characteristics of the communications capabilities. Redundant communications among personnel responsible for transport security provide a means to immediately report an unusual occurrence that could lead to the sabotage or diversion of the material. Early notification provides for a more timely response from law enforcement, thereby reducing the risk of the use of the material for malevolent purposes.

- (10) Revise the requirements of 10 CFR 73.37(b)(9) to ensure that during periods when a shipment vehicle is stopped (including when a rail shipment is in a marshalling area) or when a shipment vessel is docked at least one armed escort is awake at all times, maintains constant visual surveillance of the shipment, and reports shipment status to the movement control center at periodic preset intervals.

This revision to the requirements of 10 CFR 73.37 provides reasonable assurance that the material is protected from sabotage or diversion when it is stationary.

- (11) Revise the requirements of 10 CFR 73.37, within the limits of existing law, to establish both minimum and contingency weaponry for armed escorts. This revision to the requirements of 10 CFR 73.37 would not apply to LLEA performing escort duties.

The requirements of 10 CFR 73.37(b)(10) provide for training of armed escorts, but does not specifically require minimum primary and contingency (i.e. back-up) weaponry. This revision to the requirements of 10 CFR 73.37 provides reasonable assurance that armed escorts are prepared for an assault situation and are able to respond appropriately to prevent the sabotage or diversion of the SNF. This requirement may be effected by Commission direction following review of SECY-08-0050 titled "Firearms Guidelines Implementing Section 161A of the Atomic Energy Act of 1954 and Associated Policy Issue."⁷ This paper includes a request for Commission direction on the use of enhanced weaponry by armed escorts during the transport of SNF.

- (12) Protect as SGI such information as transportation security plans, schedules and itineraries⁸, details of alarm and communication systems, communication protocols, duress codes, response procedures, LLEA escort information, and other LLEA arrangements.

Protecting shipment information as SGI and on a need-to-know basis provides reasonable assurance against the inadvertent or deliberate release of the information, thereby protecting the shipment from sabotage or diversion.

- (13) Move the notification requirements of 10 CFR 71.97 to 10 CFR Part 73. Revise the advance notification requirements to include radioactive waste shipments consisting of radioactive materials in quantities of concern (RAMQC) in Category 1 quantities. Ensure that the Governor or the Governor's designee contact information required by 10 CFR 71.97 and 10 CFR 73.37(f) is consistent.

⁷ SECY-08-0050 titled "Firearms Guidelines Implementing Section 161A of the Atomic Energy Act of 1954 and Associated Policy Issue" was submitted to the Commission on April 17, 2008 for Notation Vote.

⁸ For shipments that are not inherently self-disclosing, the schedule and itinerary information may be decontrolled after 2 days. For shipments that are inherently self-disclosing, the schedule may be released as necessary after departure.

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The advance notification requirements for both irradiated reactor fuel and HRCQ of radioactive waste of 10 CFR 71.97 are largely for a security function and should therefore be included in 10 CFR Part 73. This requirement ensures consistency with the concurrent rulemaking for in-transit security during shipments of RAMQC. This requirement also ensures that the NRC and States are properly notified beforehand about shipments of irradiated reactor fuel and high level waste. This requirement mitigates the risk of sabotage or diversion of a shipment.

- (14) Ensure for shipments of less than 100 grams of SNF with a total external dose rate in excess of 100 rems per hour at a distance of 3 feet without intervening shielding that the security measures for shipments of RAMQC Category 1 are in place.

The regulations of 10 CFR 73.37 apply to shipments of spent fuel in excess of “100 grams in net weight of irradiated fuel in exclusive of cladding or other structural or packaging materials which has a total external dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding.” The staff recommends that transportation security for shipments of less than 100 grams of SNF be similar to that for a RAMQC Category 1 shipment.