

Comparison and Analysis of Regulatory and Derived Requirements for Certain
DOE Spent Nuclear Fuel Shipments
Lessons Learned for Future Spent Fuel Transportation Campaigns

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Abstract

Radioactive materials transportation is stringently regulated by the Department of Transportation and the Nuclear Regulatory Commission to protect the public and the environment. As a Federal agency, however, the U.S. Department of Energy (DOE) must seek State, Tribal and local input on safety issues for certain transportation activities. This interaction has invariably resulted in the imposition of extra-regulatory requirements, greatly increasing transportation costs and delaying schedules while not significantly enhancing the level of safety. This paper discusses the results an analysis of the regulatory and negotiated requirements established for a July 1998 shipment of spent nuclear fuel from foreign countries through the west coast to the Idaho National Engineering and Environmental Laboratory (INEEL). Staff from the INEEL Nuclear Materials Engineering and Disposition Department undertook the analysis in partnership with HMTc, to discover if there were instances where requirements derived from stakeholder interactions duplicate, contradict, or otherwise overlap with regulatory requirements.

The study exhaustively lists and classifies applicable Department of Transportation (DOT) and Nuclear Regulatory Commission (NRC) regulations. These are then compared with a similarly classified list of requirements from the Environmental Impact Statements (EIS) and those developed during stakeholder negotiations. Comparison and analysis reveals numerous attempts to reduce transportation risk by imposing more stringent safety measures than those required by DOT and NRC. These usually took the form of additional inspection, notification and planning requirements. There are also many instances of overlap with, and duplication of regulations.

Participants will gain a greater appreciation for the need to understand the risk-oriented basis of the radioactive materials regulations and their effectiveness in ensuring safety when negotiating extra-regulatory requirements.

INTRODUCTION:

The Department of Transportation (DOT) and the Nuclear Regulatory Commission (NRC) to protect the public and the environment stringently regulate radioactive materials transportation. As a Federal agency, however, the U.S. Department of Energy (DOE) must seek State, Tribal

and local input on safety issues for certain transportation activities. This interaction has invariably resulted in the imposition of extra-regulatory or “externally derived” requirements, greatly increasing transportation costs and delaying schedules while not significantly enhancing the level of safety. This paper discusses the results an analysis of the regulatory and negotiated requirements established for a July 1998 shipment of United States origin spent nuclear fuel from foreign countries through the west coast to the Idaho National Engineering and Environmental Laboratory (INEEL). Staff from the INEEL’s Nuclear Material Engineering and Disposition Department undertook the analysis, in partnership with HMTc, to discover if there were instances where requirements derived from stakeholder interactions duplicate, contradict, or otherwise overlap with regulatory requirements.

The study exhaustively lists and classifies applicable DOT and NRC regulations. These are then compared with a similarly classified list of requirements from the Final Environmental Impact Statement on a Proposed Nuclear Weapons Non-proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (FRR EIS) and those developed during stakeholder negotiations conducted along the shipping route between Concord California and the INEEL. Comparison and analysis reveals numerous attempts to reduce transportation risk by imposing more stringent safety measures than those required by DOT and NRC. These usually took the form of additional inspections, notifications, and planning requirements. There are also many instances of overlap with, and duplication of regulations.

BACKGROUND

In December 1953, the United States (U. S.), under the direction of President Dwight D. Eisenhower, established the Atoms for Peace Program. Under this agreement the United States agreed to supply research reactor technology and the required enriched uranium fuel to 41 nations. In return, these nations agreed not to develop uranium enrichment capability. The program thus sought to promote the peaceful applications of nuclear energy while discouraging the proliferation of nuclear weapons.

The Spent Nuclear Fuel Return Program

As a part of the Atoms for Peace program, the U. S. also made a commitment to take back the supplied foreign research reactor (FRR) nuclear fuel once it was "spent." This responsibility was undertaken because some of the spent nuclear fuel (SNF) would still contain uranium of sufficient enrichment for use in nuclear weapons. (U. S. DOE a, 1996, 1-4) Under the return program, SNF was shipped to the U.S. for reprocessing, and replaced with fresh fuel. This was carried out successfully from the inception of the program until 1988 when the agreement expired for fuels containing highly enriched uranium (HEU). (As the Atoms for Peace Program progressed, efforts were made to replace HEU with fuel of lower enrichment (LEU). The agreement for return of LEU expired in 1992.) With the 1988 expiration of the HEU return program, DOE began an environmental review to determine if the program could be reinstated and continue in its previous configuration, or if programmatic changes were necessary to protect the environment. In 1991, DOE issued an environmental assessment of a proposed extension of the program. Public comments on that assessment asserted that no decision about long-term policy should be made until completion of a full environmental impact statement. In 1993, DOE

announced its decision to prepare, in conjunction with the U. S. Department of State, an environmental impact statement to evaluate the effects of implementing a new foreign research reactor spent fuel program. On April 21, 1995, DOE issued a draft environmental impact statement. The draft analyzed three alternatives:

1. Take back and manage foreign research reactor spent fuel in the U. S.
 2. Facilitate the management of foreign research reactor spent fuel overseas.
 3. Use a combination of elements from the first two alternatives.
- (National Safety Council, 1998, 7)

Both DOE and the Department of State concluded that taking back and managing the foreign research reactor spent fuel in the U. S. would best support the nation's nuclear non-proliferation policy.

Public Involvement in the EIS Process

A 90-day public comment period, ending on July 20, 1995, followed issuance of the draft environmental impact statement. During the comment period, DOE held 17 public hearings with a total of approximately 900 persons attending. In addition to oral comments made at the hearings, DOE received over 5,000 written comments on a variety of policy, economic, and technical issues. (U. S. DOE a, 1996, 64-65) The public comments addressed a wide range of policy, economic, and technical issues. Of the approximately 6000 written and oral comments received, few were critical of, or directed against, the analytical methods presented in the Draft EIS. The questions and comments were in the following general areas:

- ✓ Policy Considerations and Management Alternatives
- ✓ Ultimate Disposition
- ✓ Transportation and Emergency Response
- ✓ Port Selection Criteria and Activities
- ✓ Health Effects and Environmental Risks
- ✓ Economic Impacts to Candidate Port and Site Communities
- ✓ Public Involvement Process. (U. S. DOE a, 1996, 66-75)

In February 1996, DOE issued the final environmental impact statement designating Alternative 1 as the preferred alternative, and on May 13, 1996 issued a record of decision announcing the adoption of Alternative 1. (U. S. DOE b, 1996)

West Coast Shipment of Foreign Research Reactor Spent Nuclear Fuel

With the issuance of the Record of Decision and as part of the renewed return program, DOE began preparing to bring up to five shipments of FRR SNF from sites in Asia to the INEEL. The over-all plan was to bring the shipments to the west coast of the U.S. by sea, then overland to the INEEL. It was learned that some members of the public living near the ports of entry strongly preferred the use of rail for the overland portion of the shipment. DOE has sought generally to transport spent nuclear fuel by rail and the environmental impact analysis concluded that FRR SNF could be shipped safely overland either by highway or by rail, so it was agreed to use this

mode for the first west coast shipment. (U. S. DOE a, 1996, 68) In 1996, DOE issued an implementation plan with clearly stated roles and responsibilities for each transportation function. (U. S. DOE c, 1996)

In January 1997, the INEEL was given responsibility for preparing a transportation plan for the west coast shipment. The plan was to contain information about routing, shipment mode, shipment tracking, security, key contacts, and emergency preparedness procedures. The plan would also include information about the operational roles and responsibilities of DOE, the carrier, state, local and tribal officials, as well as other agencies. Working groups formed to assist in the development of the plan included representatives from state, tribal and regional organizations; federal agencies and departments, such as DOT, including the Coast Guard and the Federal Rail Administration, the Department of the Navy, Department of Commerce, Department of Justice, and the Environmental Protection Agency; state, local and tribal officials whose jurisdictions are directly affected by the shipments; shipping agents; and port authorities.

The DOE also conducted public safety needs assessments to determine whether local emergency responders (including hazardous material teams, firefighters, and law enforcement units) required additional capabilities, training or equipment, to respond adequately to potential emergencies associated with the shipment of foreign research reactor spent nuclear fuel. Based on the specific needs indicated, DOE provided localities with additional training, such as radiological first responder, and/or radiological detection equipment. After receiving the additional training and/or equipment, state, local, and tribal officials convened to validate their readiness to respond appropriately in the event of an accident.

The first west coast shipment of foreign research reactor spent nuclear fuel was originally scheduled for August 1997 but did not occur until July 1998. There were several reasons for the delay, but the largest contributing factor was the difficulty involved in the development of a plan that would satisfy the externally derived requirements. The DOE has shipped nuclear materials for more than 40 years with a nearly perfect safety record. The Department clearly understands the regulatory requirements for safe transportation, but in the case of this highly controversial, politically charged environment, there were numerous other requirements to be identified and addressed before the plan could be completed and shipment could occur. Failure to adequately recognize this fact not only led to a schedule delay, but also caused added stakeholder resistance because their needs were not adequately considered during the initial preparations. The need to overcome this added resistance led to the delay and to many of the extra-regulatory requirements discussed below.

REQUIREMENTS COMPILATION AND ANALYSIS

Post-Shipment Requirements Compilation

Following its completion in July 1998, the INEEL was tasked with compiling a listing of all requirements for the west coast FRR SNF shipment. For this compilation, the requirements were classified into four main categories:

- DOT regulations for SNF rail transportation,

- NRC regulations for SNF rail transportation,
- Requirements established under the EIS, and
- Additional requirements routinely incorporated for DOE owned shipments, along with the “externally derived” requirements incorporated into the west coast FRR SNF shipping plan.

The first category, DOT SNF rail transport regulations, comprises requirements that must be satisfied by any shipper of SNF including private sector organizations. The DOT requirements were extracted from the Code of Federal Regulations (CFR) Section 49 which deals with the movement of hazardous materials and specific requirements associated with the transportation by rail. The second category is additional transportation regulations for NRC licensed activities. These NRC requirements were extracted from 10 CFR. The third set includes those "internally derived" requirements that DOE imposed upon its self, either through the formal DOE Orders process or through the FRR-specific EIS process. The internally derived requirement set was extracted from applicable formal DOE Orders and Directives, the FRR EIS, and the associated ROD, and the ROD implementation plan. The fourth requirement category consists of “externally derived” requirements that were established through negotiations with affected state, local, and tribal governments along the shipping route. The “externally derived” requirements were extracted from documentation of the negotiation process for agreements with affected state, local, and tribal units of government along the transportation route and the transportation plan. For the sake of comparison, each requirement was documented at the level where a discrete action was necessary to satisfy the requirement without regard to the complexity or duration of the action. **Table 1** provides a breakdown of the number of requirements in each category found during this compilation.

Table 1Originally-Listed 1998 West Coast Shipment Requirements Foreign Research Reactor Spent Nuclear Fuel Transportation

Source	U. S. Department of Transportation	U. S. Nuclear Regulatory Commission	“Internally Derived”	“Externally Derived”
Number of Requirements	121	61	112	100
TOTAL	182		212	

Requirements Compilation Refinement and Validation

In 2002 a follow-up study was conducted to more closely examine the nature of the compiled requirements, primarily to confirm the accuracy of the compilation and to identify and analyze any redundancy among requirements. A review of the original compilation resulted in elimination from the listing of 38 inappropriate DOT regulations and two inappropriate NRC regulations.

Similar examination of the internally derived DOE Regulatory and EIS-based requirements resulted in a reduction in the listing from 112 to 104 due to discovery of duplication with DOT or NRC regulatory requirements or duplication of requirements within the EIS itself.

The externally derived requirements set was also scaled back from 100 to 66 requirements based on discovery of exact duplication of regulatory requirements or EIS based requirements as well as duplication of listed requirements within the "Externally Derived" category. **Table 2** the number of requirements in listed in each category following the review.

**Table 21998 West Coast Shipment Requirements
Foreign Research Reactor Spent Nuclear Fuel Transportation**

Source	U. S. Department of Transportation	U. S. Nuclear Regulatory Commission	"Internally Derived"	"Externally Derived"
Number of Requirements	83	59	104	66
TOTAL	142		170	

Following the validation process, the requirements listings placed in sub-categories and reordered to reflect the chronological order in which they would be applied, including pre-shipment, in-transit, and post-shipment activities. The completed requirements list is shown in the **Attachment**.

Requirements Analysis

As shown, the addition of internal and external extra-regulatory requirements more than doubled the number of requirements for this shipment. A breakdown of the time and cost necessary to comply with DOT and NRC regulations versus those needed to satisfy the extra-regulatory requirements is not available. However, the original estimate of the cost to complete the shipment was approximately \$5M, while the actual cost exceeded \$15M. Examination of the nature of each of the four categories suggests that a large share of the unanticipated costs may be attributable to the extra-regulatory requirements. Shippers and carriers routinely comply with DOT and NRC regulations so that a relatively small amount of preparatory work is required to address many of them. Virtually all of the forty-three (43) DOT requirement listed under subheadings 3.0, 4.0, 6.0, 7.0, 8.0 and 10.0, for instance, are dictated by the nature of the material. Of these, only selecting and obtaining proper packaging (subheading 4.0) requires significant effort or expense. A substantial portion of the NRC regulations - the twenty-two (22) listed under subheadings 2.0, 3.0, 4.0, 5.0, and 6.0 - are also packaging-related and require significant resources for compliance. Compliance with DOT and NRC packaging regulations, however, required no new technology, negotiations with multiple parties, or new policy development and agreements, but only negotiations with a contract carrier and adherence to long-established protocols. Of the NRC regulations not related to packaging, the great preponderance address physical protection. Again, there is significant expense associated with this activity, but compliance requires only accessing existing resources and following established protocols.

While some of the extra-regulatory requirements, particularly those in the "Internal Derived" category, are routinely applied to DOE SNF shipments, a great many were developed

specifically for this shipment. This development process itself was time consuming and expensive, requiring negotiations with virtually every governmental jurisdiction along the route, along with extensive documentation and verification efforts. Further, once the requirements were agreed upon, documented and verified, compliance required a great deal of time and effort, particularly those related to planning and training, because of the need to develop new and unique, shipment-specific programs and procedures.

Examination of the DOT and NRC regulations versus the extra-regulatory requirements revealed little or no actual redundancy. For the most part, rather, the extra-regulatory, derived requirements were extensions of regulatory requirements, incorporation as requirement of non-regulatory but standard shipper/carrier procedures, or extensions or modification of those procedures. As such, it can be argued that these extra-regulatory requirements decreased the safety risks associated with the shipment. How significant this reduction might have been is beyond the scope of this discussion. Certainly some contributed more than others, and some of those undoubtedly contributed enough to justify the added time and expense needed for compliance. It should be noted, however, that in some cases attempts to modify standard carrier procedures had the potential to decrease safety. Some of the external derived requirements listed in subheading 4.0 addressing train speed, for instance did not take into account the speeds necessary to maintain train stability when rounding certain banked curves, where slower speeds actually increase the likelihood of derailment.

CONCLUSION

Analysis of the requirements for the 1998 FRR West Coast Shipment suggests that there was some need for DOE to self impose requirements beyond those codified in 49 and 10 CFR. The development of these “derived” requirements was driven by operational concerns that are specific to the movement of DOE owned SNF from foreign countries. Similar activities by others would probably also require the development of additional or “derived” operational requirements. The CFR is certainly not all-inclusive when it comes to operational interfaces associated with specific shipments. The purpose of this study was to identify, categorize and analyze the requirements for the 1998 FRR West Coast SNF shipment in an effort to help streamline the process for future shipments.

On September 23, 2002, Secretary of Energy Spencer Abraham, formally issues the “Radioactive Material Transportation Practices Manual”, which establishes a set of standard transportation practices for DOE programs to use in planning and executing offsite shipments of radioactive materials including radioactive waste. The manual is composed of 14 transportation practices that establish a standardized process and framework for interacting with State, tribal, and local authorities and transportation contractors and carriers regarding DOE radioactive material shipments. DOE programs are responsible for compliance with all applicable regulations and agreements with State, tribal, and local authorities. The regulations provided a comprehensive basis for safely and securely shipping classified and unclassified radioactive materials. (U.S. DOE, 2002) This effort by DOE to standardize transportation practices came at the request of the State, tribal, and local authorities, that deal with the many differing DOE shipments. The development process included a review and comment cycle by States and tribal authorities. The

effects of the standardized practices are yet to be seen, but it is expected that the number of externally derived requirements will significantly drop as the practices are put into place.

The DOE and other commercial shippers of radiological materials routinely ship materials under the regulations and requirements set forth by the Department of Transportation and the Nuclear Regulatory Commission. In the State of California alone there are over 2000 shipments of radiological materials transported daily under these regulations. These shipments arrive safely with virtually no notice by the general public. What drove the stakeholders then to demand additional requirements? The answers include a lack of trust in DOE, or any other federal agency for that matter, the relationship between these shipments and nuclear weapons, the selection of the port of entry (San Francisco Bay Area), and the lack of involvement by potentially affected interests in the initial phases of the process. The last point was in essence the largest contributor to additional requirements.

REFERENCES

National Safety Council, A Guide to Foreign Research Reactor Spent Nuclear, (1998)

a) United States Department of Energy, Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, Assistant Secretary for Environmental Management, (1996)

b) United States Department of Energy, Record of Decision on a Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, Assistant Secretary for Environmental Management, (1996)

c) United States Department of Energy, Implementation Strategy Plan for: Foreign Research Reactor Spent Nuclear Fuel Shipments, Office of Nuclear Material and Facility Stabilization, Office of Environmental Management, (1996)

U. S. Department of Energy, Radioactive Material Transportation Practices Manual, DOE M 460.2-1, Assistant Secretary for Environmental Management, September 2002

ATTACHMENT

FRR West Coast Shipment Requirements

DOT Radiological In Commerce

1.0 Administrative

DOT 1.1 State, political subdivision, Indian Tribe fee 49 CFR 107.202(c)
DOT 1.2 Federal hazardous materials transportation law to be followed 49 CFR 171.1(b)
DOT 1.3 Registration applicability 49 CFR 107.601(a)(1)&(6)
DOT 1.4 Yearly registration required 49 CFR 107.608(a)
DOT 1.5 Certificate of registration must be on file 49 CFR 107.608(b)
DOT 1.6 Registration fee 49 CFR 107.612(b)(2)&(3)
DOT 1.7 Payment procedures 49 CFR 107.616
DOT 1.8 Registration record keeping 49 CFR 107.620
DOT 1.9 Packaging must be manufactured, certified and used according to DOT requirements 49 CFR 171.2(c)
DOT 1.10 General package design requirements for Class 7 (Radioactive) 49 CFR 173.410
DOT 1.11 Requirements for Type B packages 49 CFR 173.413, 49 CFR 173.467
DOT 1.12 Thermal limitations 49 CFR 173.442
DOT 1.13 Quality control of packaging 49 CFR 173.474
DOT 1.14 Offerer must be registered with the USNRC 49 CFR 173.471(a)(b)
DOT 1.15 Handling of placarded rail cars 49 CFR 174.82(b)
DOT 1.16 Emergency response information available for use 49 CFR 172.600(c)(1) and (2)
DOT 1.17 Pre-shipment shipper responsibilities 49 CFR 173.22(c)
DOT 1.18 Follow IAEA regulations 49 CFR 173.12(d)

2.0 General

DOT 2.1 Offerer to properly prepare and carrier to verify hazardous materials shipments 49 CFR 171.2(a)
DOT 2.2 Carrier to properly transport hazardous material 49 CFR 171.2(b)

3.0 Material Identification

DOT 3.1 Identify hazard class or division 49 CFR 173.22(a)(1), 49 CFR 172.101(d)
DOT 3.2 Choose hazardous material descriptions and proper shipping names 49 CFR 172.101(c)
DOT 3.3 Assign identification number 49 CFR 172.101(e)
DOT 3.4 Identify labels 49 CFR 172.101(g)

4.0 Packaging Selection

DOT 4.1 Reference applicable packaging authorization 49 CFR 173.22(a)(2), 49 CFR 172.101(i)
DOT 4.2 Package must not release any hazardous materials 49 CFR 173.24(b)
DOT 4.3 Authorized packagings 49 CFR 173.24(c)
DOT 4.4 Compatibility: Ensure that packagings are compatible with lading 49 CFR 173.24(e)(1)
DOT 4.5 Compatibility: No significant chemical or galvanic reaction between packaging materials and contents of the package 49 CFR 173.24(e)(2)
DOT 4.6 Compatibility: Mixed contents 49 CFR 173.24(e)(4)
DOT 4.7 Compatibility: Packagings used for solids that must be capable of containing material in the liquid state 49 CFR 173.24(e)(5)
DOT 4.8 Closures on packagings 49 CFR 173.24(f)
DOT 4.9 Authorized Type B packagings 49 CFR 173.416
DOT 4.10 Authorized Fissile material packagings 49 CFR 173.417

5.0 Package Inspection and Survey

DOT 5.1 Quality control for Class 7 shipments 49 CFR 173.475
DOT 5.2 Radiation level limitations 49 CFR 173.441
DOT 5.3 Contamination control 49 CFR 173.443
DOT 5.4 Thermal limitations (see DOT 1.12) 49 CFR 173.442

6.0 Package Markings

DOT 6.1 Marking requirements 49 CFR 172.304
DOT 6.2 General marking requirements for non-bulk packaging 49 CFR 172.301
DOT 6.3 Mark gross mass for packages over 50 kg 49 CFR 172.310(a)
DOT 6.4 Mark package Type B 49 CFR 172.310(b)
DOT 6.5 Radiation symbol required on Type B packages 49 CFR 172.310(c)

7.0 Package Labeling

DOT 7.1 General labeling requirements 49 CFR 172.400
DOT 7.2 Label HRCO with Radioactive Yellow - III 49 CFR 172.403(c)
DOT 7.3 Label specifications 49 CFR 172.407
DOT 7.4 Radioactive Yellow-III label 49 CFR 172.440
DOT 7.5 Two labels required 49 CFR 172.403(f)
DOT 7.6 Information required on labeling 49 CFR 172.403(g)
DOT 7.7 Placement of labels 49 CFR 172.406

8.0 Documentation

DOT 8.1 General entries on shipping papers 49 CFR 172.201
DOT 8.2 Description of hazardous material on shipping papers 49 CFR 172.202(a)
DOT 8.3 Additional radioactive material description requirements 49 CFR 172.203(d)(2)-(6), (8)-(10), 49 CFR 173.471(c)
DOT 8.4 Additional shipping paper requirement by rail 49 CFR 172.203(g)(1)
DOT 8.5 Shipper's certification 49 CFR 172.204
DOT 8.6 Emergency response telephone number 49 CFR 172.604
DOT 8.7 Emergency response information required 49 CFR 172.602(a)
DOT 8.8 Form of emergency response information 49 CFR 172.602(b)
DOT 8.9 Shipping papers required to ship hazardous material by rail 49 CFR 174.24
DOT 8.10 Maintenance of emergency response information by carrier 49 CFR 174.26(b), 49 CFR 172.602(c)(1)

9.0 Package Loading

DOT 9.1 Secure Class 7 material 49 CFR 173.448(a)
DOT 9.2 Secure Class 7 material rail transport 49 CFR 174.55(a)

10.0 Transport Vehicle Placarding

DOT 10.1 General placarding requirement 49 CFR 172.504
DOT 10.2 Placarding required for Radioactive Yellow-III labeled packages 49 CFR 172.504(e)
DOT 10.3 General specification for placards 49 CFR 172.519
DOT 10.4 Radioactive placard 49 CFR 172.556
DOT 10.5 Visibility and display of placards 49 CFR 172.516
DOT 10.6 Placarding for rail 49 CFR 172.508
DOT 10.7 Vehicle placarding for rail cars 49 CFR 174.59

11.0 Rail Car Positioning

DOT 11.1 Position of radioactive waste in train 49 CFR 174.85(b)
DOT 11.2 Maintain document indicating position of hazardous material on train 49 CFR 174.26(a)

12.0 Carrier Responsibilities

DOT 12.1 Maintenance of emergency response information by facility operators 49 CFR 172.602(c)(2)
DOT 12.2 Forward shipment within 48 hours of receiving 49 CFR 174.14(a)
DOT 12.3 Immediate notice of incidents 49 CFR 171.15
DOT 12.4 Delivery at agency stations 49 CFR 174.16(b)
DOT 12.5 Incident reports 49 CFR 171.16

NRC Radiological In Commerce

1.0 Quality Assurance

NRC 1.1 Quality assurance 10 CFR 71 Subpart H

WM'03 Conference, February 23-27, 2003, Tucson, AZ

2.0 Package Testing Protocols

NRC 2.1 Package testing requirement for normal conditions of transport 10 CFR 71.71
NRC 2.2 Package testing requirement for hypothetical accident conditions 10 CFR 71.73

3.0 Package Approval Standards

NRC 3.1 Demonstration of compliance 10 CFR 71.41
NRC 3.2 General packaging requirements 10 CFR 71.43
NRC 3.3 Lifting and tie-down standards 10 CFR 71.45
NRC 3.4 External radiation standards for all packages 10 CFR 71.47
NRC 3.5 Type B requirements 10 CFR 71.51
NRC 3.6 Fissile material package requirements 10 CFR 71.55
NRC 3.7 Standards for arrays of fissile material packages 10 CFR 71.59
NRC 3.8 Requirements for irradiated nuclear fuel shipments 10 CFR 71.61
NRC 3.9 Additional requirements 10 CFR 71.65

4.0 Application for Package Approval

NRC 4.1 Application for Package Approval 10 CFR 71 Subpart D

5.0 Package License

NRC 5.1 General license: NRC approved package 10 CFR 71.12

6.0 Package Operating Procedures

NRC 6.1 Applicability of operating controls and procedures 10 CFR 71.81
NRC 6.2 Package meets all requirements: Preliminary determinations 10 CFR 71.85
NRC 6.3 Package meets all requirements: Routine determinations 10 CFR 71.87
NRC 6.4 Opening instructions available to consignee 10 CFR 71.89
NRC 6.5 Records 10 CFR 71.91
NRC 6.6 Inspection and tests 10 CFR 71.93
NRC 6.7 Reports 10 CFR 71.95
NRC 6.8 Advance notification of shipment of irradiated reactor fuel and nuclear waste 10 CFR 71.97

7.0 Transportation of Licensed Material

NRC 7.1 Transportation of licensed material 10 CFR 71.5

8.0 Physical Protection Information

NRC 8.1 General performance requirement 10 CFR 73.21(a)
NRC 8.2 Physical protection in transit 10 CFR 73.21(b)(2)
NRC 8.3 Inspections, audits and evaluations 10 CFR 73.21(b)(3)
NRC 8.4 Safeguards Information: access, protection, preparation/marketing, reproduction/destruction, external transmission, using ADP systems, and category removal 10 CFR 73.21(c)-(i)

9.0 Physical Protection Performance Capabilities

NRC 9.1 Performance capabilities for physical protection of strategic special nuclear material in transit 10 CFR 73.25
NRC 9.2 Transportation physical protection system 10 CFR 73.26(a)-(i)
NRC 9.3 Shipments by rail and by sea 10 CFR 73.26(k)&(l)
NRC 9.4 Transportation physical protection systems, subsystems, components, and procedures 10 CFR 73.26

10.0 Physical Protection Measures

NRC 10.1 Requirements for physical protection of irradiated reactor fuel in transit 10 CFR 73.37(a)-(g)
NRC 10.2 Advance notification of shipment of irradiated reactor fuel and nuclear waste 10 CFR 71.97
NRC 10.3 Advance notification to state 10 CFR 73.37(f)
NRC 10.4 Notification must be postmarked 7 days before shipment 10 CFR 73.37(f)(1)
NRC 10.5 Type of information to be furnished in notification 10 CFR 73.37(f)(2)
NRC 10.6 Additional information to be supplied with the notification 10 CFR 73.37(f)(3)&(4)
NRC 10.7 Training of escorts 10 CFR 73.37(b)(10)
NRC 10.8 NRC approval of routes 10 CFR 73.37(b)(7)
NRC 10.9 Written log required of shipment 10 CFR 73.37(b)(5)
NRC 10.10 Minimize intermediate stops 10 CFR 73.37(b)(8)
NRC 10.11 At least one escort maintains visual surveillance 10 CFR 73.37(b)(9)
NRC 10.12 Physical protection requirements of spent nuclear fuel: Shipments by rail 10 CFR 73.37(d)
NRC 10.13 Arrange with local law enforcement for emergency response 10 CFR 73.37(b)(6)
NRC 10.14 Physical protection requirements of spent nuclear fuel: Shipments without shielding 10 CFR 73.37(a)(1)
NRC 10.15 Physical protection requirements of spent nuclear fuel: Achieving protection objectives 10 CFR 73.37(a)(2)
NRC 10.16 Physical protection requirements of spent nuclear fuel: General requirements 10 CFR 73.37(b)
NRC 10.17 Communications center required 10 CFR 73.37(b)(4)
NRC 10.18 Escorts call every 2 hours 10 CFR 73.37(b)(11)
NRC 10.19 2 escorts required in heavily populated areas 10 CFR 73.37(d)(1)
NRC 10.20 1 escort required when not in heavily populated areas 10 CFR 73.37(d)(1)
NRC 10.21 Communication requirements for escorts 10 CFR 73.37(d)(3)
NRC 10.22 Escort requirements while on vessel at US port 10 CFR 73.37(e)(1)(3)
NRC 10.23 Notification to governor of state prior to SNF shipment 10 CFR 73.37(f)
NRC 10.24 Protection of schedule information 10 CFR 73.37(g)

11.0 Physical Protection Qualifications

NRC 11.1 General criteria for security personnel 10 CFR 73 Appendix B

12.0 Physical Protection Record Keeping and Reporting

NRC 12.1 Records 10 CFR 73.70
NRC 12.2 Reporting of safeguards events 10 CFR 73.71

13.0 Shipment Advance Notification

NRC 13.1 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 10 CFR 73.72
NRC 13.2 Requirement for advance notice and protection of import shipments of nuclear material from countries that are not party to the Convention on the Physical Protection of Nuclear Material 10 CFR 73.74

DOE Internal Derived Requirements

1.0 Program Considerations

EIS 1.1 FRR SNF transportation governed by NRC/DOT Regs. Implementation Plan
EIS 1.2 Waste min. and PP objectives ROD
EIS 1.3 Apply CRWM QA requirements to SNF Implementation Plan
EIS 1.4 SLs [may] impose added reqs. on SNF shipments FRR EIS Public Comm
EIS 1.5 Comply with Idaho consent Agreement after 2000 Implementation Plan

2.0 Program Initiation

EIS 2.1 Coordinate with CJs to resolve issues FRR EIS Appendix H
EIS 2.2 Ensure program coordination with agencies FRR EIS Appendix H
EIS 2.3 Use CAs to facilitate participation of STLs Implementation Plan
EIS 2.4 MOUs/CAs with FA & STLs may be necessary ROD Implementation Plan
EIS 2.5 Comply with MOUs/CAs between DOE, and STLs Implementation Plan
EIS 2.6 Provide technical assistance to CJs FRR EIS Appendix H
EIS 2.7 Provide ER advice and rad monitoring assistance FRR EIS Appendix H
EIS 2.8 Review draft TP plans Implementation Plan

3.0 Identify Logistical Requirements

EIS 3.1 No conflicting port activities FRR SNF - Appendix D
EIS 3.2 Ports to have current SNF handling experience FRR SNF - Appendix D
EIS 3.3 Security to comply with military/NRC requirements FRR EIS Appendix H
EIS 3.4 Establish IAs between DOE and DOD FRR EIS Appendix H
EIS 3.5 Determine Transport mode with STLs Implementation Plan
EIS 3.6 Incorporate Regional STL preferences Implementation Plan
EIS 3.7 Use rail for shipments pending discussions with STL ROD

4.0 Communication Planning

EIS 4.1 Use satellite communication system (DOE Policy) FRR EIS Appendix H
EIS 4.2 Coordinate communications with DOE-HQ, FAs, CJs FRR EIS Appendix H
EIS 4.3 Interact with public and media FRR EIS Appendix H
EIS 4.4 Coordinate media interactions FRR EIS Appendix H
EIS 4.5 Include media comm. plan in Overall TP FRR EIS Appendix H
EIS 4.6 Develop Public Comm Plan Implementation Plan
EIS 4.7 Coordinate timely information to media FRR EIS Appendix H

5.0 Transportation Planning

EIS 5.1 Prepare a TP in cooperation with STL ROD
EIS 5.2 Prepare detailed TP involving STL ROD
EIS 5.3 Prepare TP with specific contents FRR EIS Appendix H
EIS 5.4 Develop TP and include: shipment schedule Implementation Plan
EIS 5.5 Develop TP based on DOE/EIS-0218F; Orders, BATT Order Implementation Plan
EIS 5.6 TP to include schedule, route, EP, Comm. FRR EIS Appendix H
EIS 5.7 Develop extra-regulatory guidelines as necessary FRR EIS Appendix H
EIS 5.8 Transportation plan requirements DOE 460.2
EIS 5.9 Do planning between DOE, STLs, Shippers, FAs FRR EIS Appendix H
EIS 5.10 Use ALARA, waste min. & PP ROD
EIS 5.11 Keep records ships, crews, target materials ROD
EIS 5.12 Review site readiness Implementation Plan
EIS 5.13 Use TRANSCOM to track land shipments; INMARSAT for ocean tracking (DOE Order) Implementation Plan
EIS 5.14 Use TRANSCOM to track shipments DOE 460.2
EIS 5.15 Use ATMS for tasks DOE 460.2
EIS 5.16 Onsite safety requirements DOE 460.1A
EIS 5.17 Develop intersite fuel transport plan Implementation Plan

6.0 Program Shipment Scheduling

EIS 6.1 Multiple casks per shipment, up to eight max ROD
EIS 6.2 Reduce the shipments by coordinating with FRR ROD
EIS 6.3 Base schedules on optimal weather conditions Implementation Plan
EIS 6.4 Develop schedules for TRIGA shipments Implementation Plan
EIS 6.5 INEEL shipments to occur once per year Implementation Plan
EIS 6.6 Develop 13-yr schedule by December 31, 1996 Implementation Plan

7.0 Operations Planning

EIS 7.1 Develop transportation ER plans Implementation Plan
EIS 7.2 Develop ER and Recovery plans Implementation Plan
EIS 7.3 Provide ER assistance to local authorities FRR EIS Public Comm
EIS 7.4 Responsible to establish incident command FRR EIS appendix H
EIS 7.5 Establish Trans.; EP; Sec.; and ES&H procedures for jurisdiction Implementation Plan
EIS 7.6 Develop EP capabilities with STLs FRR EIS Appendix H
EIS 7.7 Provide financial, technical, training to STLs ER FRR EIS Public Comm
EIS 7.8 Develop TP document FRR EIS Appendix H
EIS 7.9 Provide CTPSP with DOT/State-approved highway/rail route FRR EIS Appendix H
EIS 7.10 Responsible for security/armored escorts (coordinate with STL) Implementation Plan
EIS 7.11 Develop/have a TP FRR EIS Appendix H
EIS 7.12 Responsible to obtain State permits FRR EIS Appendix H
EIS 7.13 Support SLs in dealing with demonstrations FRR EIS Public Comm
EIS 7.14 Maintain comprehensive EM system FRR EIS Appendix H
EIS 7.15 Prepare radiation survey map for truck/rail transport FRR SNF Appendix D
EIS 7.16 State permit may be required for SNF transport FRR SNF Appendix D

8.0 Rail Route Requirements

EIS 8.1 Use rail shipments as a general matter ROD
EIS 8.2 Select the most direct available rail route FRR SNF-Summary
EIS 8.3 Select route with STL and carrier ROD
EIS 8.4 Ensure rail lines/equipment properly inspected FRR EIS Appendix H
EIS 8.5 Conduct inspections along proposed route Implementation Plan
EIS 8.6 SRS staging period<72 hrs. Implementation Plan

9.0 Readiness Training

EIS 9.1 Provide ER training/technical assistance to STLs Implementation Plan
EIS 9.2 Conduct walk-through of ER responsibilities Implementation Plan
EIS 9.3 Provide training, offices, RAP teams for EM system FRR EIS Appendix H
EIS 9.4 Provide IEIA training course for FRR operators Implementation Plan

10.0 Pre-shipment Notifications

EIS 10.1 State and tribal notification DOE 460.2
EIS 10.2 Notification of schedule changes DOE 460.2

11.0 Shipment Requirements/Inspections

EIS 11.1 Provide rep at the shipment point of origin FRR EIS Appendix H
EIS 11.2 Load SNF in shipping casks FRR EIS Public Comm
EIS 11.3 Ship SNF in ISO containers FRR EIS Public Comm
EIS 11.4 RAP team may be positioned at NWS Implementation Plan
EIS 11.5 Perform inspection of ship's equipment prior to off loading Implementation Plan
EIS 11.6 State and DOE will coordinate with NRC for cask inspection prior to off-loading at the port of entry Implementation Plan
EIS 11.7 NRC may require a cask inspection FRR SNF - Appendix D
EIS 11.8 Interim inspection may also take place Implementation Plan
EIS 11.9 Do rad surveys on containers FRR EIS Public Comm

12.0 Shipment Contingencies

EIS 12.1 Notify local ER personnel FRR EIS Appendix H
EIS 12.2 Inform appropriate CJ authorities FRR EIS Appendix H
EIS 12.3 Provide ER assistance and recovery/restoration support FRR EIS Appendix H
EIS 12.4 Provide technical assistance to CJs FRR EIS Appendix H
EIS 12.5 Provide RAP teams for monitoring; provide medical advice FRR EIS Appendix H
EIS 12.6 Responsible for package/transporter recovery operations FRR EIS Appendix H
EIS 12.7 Provide advice on materials, mitigation, packaging, rad monitoring FRR EIS Appendix H
EIS 12.8 Provide ER assistance FRR EIS Appendix H

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13.0 Receipt Requirements

EIS 13.1 Notification if not received DOE 460.2
EIS 13.2 Inspect shipments on receipt DOE 460.2
EIS 13.3 Complete cask-by-cask analysis Implementation Plan
EIS 13.4 Contaminated vehicles DOE 460.2

14.0 Financial Responsibilities

EIS 14.1 Reimburse local agencies for ER ROD
EIS 14.2 Pay for transport activities of SNF to US Implementation Plan
EIS 14.3 Self-insurance policy DOE 460.2
EIS 14.4 Financially responsible for ER FRR EIS Appendix H

External Derived Requirements

1.0 Program Considerations

EDR 1.1 Use TMI shipments as model for operations planning WGA Minutes
EDR 1.2 DOE-ID will coordinate any DOE visit or briefing Public Comm Plan
EDR 1.3 DOE-HQ Congressional Office will notify congress Public Comm Plan
EDR 1.4 CA request that OR & WA be funded to attend meetings WGA Minutes

2.0 Program Initiation

EDR 2.1 Prepare Mitigation Action Plan for ROD commitments UNM FAX
EDR 2.2 Provide ER Plans to DOE WGA Minutes
EDR 2.3 Develop ER training plans UNM FAX
EDR 2.4 Make awareness training available WGA Minutes
EDR 2.5 Design rail course to deal with rad material WGA Minutes
EDR 2.6 Provide information to public before/during shipment WGA Minutes

3.0 Communication Planning

EDR 3.1 DOE-ID will develop database of contacts Public Comm Plan
EDR 3.2 Other agencies will be able to review/comment on DOE materials Public Comm Plan
EDR 3.3 DOE will respond to all inquiries Public Comm Plan
EDR 3.4 Contact media organizations to correct false information WGA Minutes
EDR 3.5 DOE-OAK, DOE-ID, DOE-SR, NWS Concord to provide media relations reps. Public Comm Plan

4.0 Rail Operations Preparations

EDR 4.1 Initially ship containers by rail from Concord NWS UNM FAX
EDR 4.2 Draft TP to conduct sensitivity analysis of model factors WGA Minutes
EDR 4.3 Preferred route does not pass through Roseville, et al Conference call notes: DOE-HQ
EDR 4.4 DOE-ID will provide FRA with a listing of railroad bridges Operational Plan
EDR 4.5 NRC may inspect rail routes independently Operational Plan
EDR 4.6 RR property inspections preempted by Fed. Govt. WGA Minutes
EDR 4.7 Conduct track inspection prior to the shipment WGA Minutes
EDR 4.8 Perform follow-up inspection Letter: DOE-HQ
EDR 4.9 UPRR and FRA will conduct separate inspections the entire length of track Operational Plan
EDR 4.10 Determine if added measures needed at rail crossings Letter: DOE-HQ
EDR 4.11 FRA inspector to inspect I Street bridge Conference call notes: DOE HQ
EDR 4.12 Train speed zones and inspection points (designated) WGA Minutes
EDR 4.13 Train speed "10 mph" when trailing highrailer Conference call notes: DOE-HQ
EDR 4.14 Train speed < 55 mph at anytime WGA Minutes
EDR 4.15 Train speed "10 mph" below posted limit WGA Minutes
EDR 4.16 When passing - one train stopped, second train 25 mph WGA Minutes
EDR 4.17 Train speed "10 mph" when on same segment with highrailer Conference call notes: DOE-HQ
EDR 4.18 Determine locations of cranes Letter: DOE-HQ
EDR 4.19 Use dedicated trains to transport spent fuel rods WGA Minutes
EDR 4.20 Use the tracks away from refinery tanks Conference call notes: DOE-HQ
EDR 4.21 Prioritize shipment over other rail traffic Conference call notes: DOE-HQ
EDR 4.22 Avoid shift changes between NWS and Benecia Bridge Conference call notes: DOE-HQ
EDR 4.23 Coordinate rail movement with other traffic Letter: DOE-HQ
EDR 4.24 Move tank cars Conference call notes: DOE-HQ

5.0 Shipment Readiness Activities

EDR 5.1 Provide training and equipment before shipment Conference call notes: DOE-HQ
EDR 5.2 DOE-ID conducts final tabletop/walk through at NWS Concord to finalize Ops Plan Operational Plan
EDR 5.3 One tabletop in each state with LLE on "need-to-know" basis WGA Minutes
EDR 5.4 Test emergency notification system in advance Letter: DOE-HQ
EDR 5.5 Identify locations of cranes for cask retrieval Conference call notes: DOE-HQ
EDR 5.6 DOE-ID will provide copies of documents to organizations Operational Plan
EDR 5.7 DOE-ID will make notifications to Native Americans Public Comm Plan

6.0 Shipment Personnel Preparation

EDR 6.1 Briefings will be provided to crews and personnel on train Operational Plan
EDR 6.2 Conduct inspection at fuel stops WGA Minutes
EDR 6.3 Provide escort over 10-yr project life WGA Minutes
EDR 6.4 Train to have comm., ER personnel with rad training Letter: DOE-HQ
EDR 6.5 A RAP team to shadow SNF train Conference call notes: DOE-HQ

7.0 Shipment Inspection Preparation

EDR 7.1 Station inspector at dispatch office during transport Letter: DOE-HQ
EDR 7.2 Final inspect rail cars UNM FAX
EDR 7.3 Inspection by State (Cal.) during cask transfer to rail UNM FAX
EDR 7.4 UPRR, FRA, NPUC, CPUC RSCD inspect locomotives & railcars Operational Plan

8.0 Shipment Requirements at the Port

EDR 8.1 Copy center available on the Pier Operational Plan
EDR 8.2 Minimize number and cost of shipments UNM FAX
EDR 8.3 New pilot required to move ship into port UNM FAX
EDR 8.4 Casks inspected on dock by DOE/INEEL/State WGA Minutes
EDR 8.5 Ship docked by second pilot UNM FAX
EDR 8.6 Transfer cargo at Concord by agreement (DOD/DOE) UNM FAX
EDR 8.7 Transfer shipment title when casks on dock WGA Minutes
EDR 8.8 FRA, NPUC, CPUC RSCD and UPRR inspect ISO Containers Operational Plan

9.0 Post-Shipment Review

EDR 9.1 Lessons learned report will be developed Operational Plan

10.0 Financial Responsibility

EDR 10.1 Pay for local law agency activities OA normal shipment WGA Minutes