Overview

1. Introduction

The Japan Nuclear Technology Institute (hereinafter “JANTI”) conducted a peer review (hereinafter “review”) with a review team comprising members and specialists from JANTI. The team visits member offices and conducts a review on themes related to nuclear power safety to extracts issues and good practices from which other members can learn from. Goals of review activities are to bring a greater awareness of safety and achieve improvements in safety culture in the nuclear industry wide.

2. Overview of Subject Locations

Nuclear Fuel Transport Co., Ltd. (hereinafter “NFT”) was established in April 1973 under its former name “NTS”. Thereafter, NTS adopted its new name NFT in June 1986, and as a general engineering company in transport that plays a part in the nuclear fuel cycle of Japan, NFT has steadily achieved results in conducting sea and ground transport of spent fuels[1] and low-level radioactive wastes[2], ground transport of returned glass solids[3] and natural uranium hexafluoride[4], and safe transport.

The Rokkasho Transport Operations Office was opened in April 1992 next to the Mutsu-ogawara Port in Rokkasho-mura in Kamikita-gun, Aomori Prefecture as an operations office to be closely involved in the community and carry out transport of nuclear fuels and so on from Mutsu-ogawara Port to nuclear fuel cycle facilities of Japan Nuclear Fuel, Ltd. (hereinafter “JNFL”).

An overview of the transport operations of NFT is as follows

- Transport of spent fuels (SF)
  NFT transports spent fuels over land and sea from nuclear stations throughout Japan to the Rokkasho Reprocessing Plant in Rokkasho, Aomori Prefecture and the Tokai Reprocessing Plant of the Japan Atomic Energy Agency in Tokai-mura, Ibaraki Prefecture.
- Low-level Radioactive Waste (LLW) Transport
  NFT transports low-level radioactive waste over land and sea from nuclear stations throughout Japan to a JNFL Low-Level Radioactive Waste Disposal Center in Rokkasho-mura, Aomori Prefecture.
- Transport of returned glass solids (HLW)
  NFT transports vitrified waste transported by sea from reprocessing plants overseas to Mutsu-ogawara Port by land to the JNFL High Radioactive Level Waste Storage

Management Center in Rokkasho-mura, Aomori Prefecture.

- Transport of natural uranium hexafluoride (UF_6)
  NFT transports natural uranium hexafluoride transported overseas from transfer plants to the Mutsu-ogawara Port by land to the JNFL Uranium Enrichment Plant in Rokkasho-mura, Aomori Prefecture.
- NFT owns and operates transport equipments such as specialized transport ships, transport containers, loading cranes and specialized transport vehicles.

NFT has 115 employees (as of the end of March 2007) in nuclear fuel transport, of which about 30 employees are employed at the Rokkasho Transport Operations Office. The head office is composed of the following divisions: the Transport Division, which establishes and manages transport projects; the Engineering Division, which designs, maintains and manages equipment and machinery including transport containers; the Safety and Quality Assurance Division; and Planning, General Affairs, and Accounting divisions. Proper employees or transfers account for approximately 70% of the workforce while the remaining 30% is seconded from electric power utilities and the like. With respect to transportation of specialized transport ships and driving of specialized vehicles in transport and related maintenance management duties, a structure is in place to outsource from a number of subcontractors.

3. Approach and Point of Review

This review is aimed at the structures and initiatives in place from the head office through to worksites with respect to safety management, etc. for the transport of nuclear fuel; therefore, the subject is not only the Rokkasho Transport Operations Office but initiatives for nuclear safety in transport management duties overall, including design management, at the head office were also reviewed. Further, the review also paid attention to work operation, communication between top management and employees and initiatives to improve quality that are linked to nuclear safety.

In addition to the four areas of “organization/management”, “education/training, “design/transport/maintenance management”, in the specific review, JANTI also examined important items such as “initiatives to improve reliability of transport facilities” and “human error prevention”. Thereupon, emphasis was also given to extracting points that could be used by other members for reference.

4. Conducting the Review

(1) Review period

Tuesday, June 12, 2007: at head office, “interview with company president”, “document review”
Wednesday, July 18 – Friday, July 20, 2007: at Rokkasho Transport Operations Office, “interview with head of office”, “site observation”, “document review”

(2) Composition of review team
Team leader: JANTI NSnet Division personnel
Team members: 4 persons under the team leader
(Fuji Electric Systems Co., Ltd.: 1; Mitsubishi Electric Corp.: 1; JANTI NSnet Division personnel: 2)

(3) Review team assigned areas
Group A: Organization/management, some important items
Group B: Education/training; emergency preparedness; design/transport/maintenance management, some important items

(4) Review team visit locations
Head office and Rokkasho Transport Operations Office

5. Review Schedule

The review was conducted for a total of four days, one day at the head office and three days at the Rokkasho Transport Operations Office, with the schedule indicated below for each group.

- Review Implementation Schedule at Head Office

<table>
<tr><th colspan="2"></th><th colspan="3">Group A
(organization/management, important items (portion))</th><th colspan="3">Group B
(education/training; emergency preparedness;
design/transport/maintenance management; important items (portion))</th></tr>
<tr><td rowspan="5">Tuesday,
June 12</td><td rowspan="2">AM</td><td colspan="6">Self-introductions,
Introduction of current state of NFT
・Organizational structure, structure of standards
・General introduction of safety activities
・Other</td></tr>
<tr><td rowspan="2">I. Organization/ management</td><td colspan="4">・Organization policies/objectives
・Leadership</td><td>Interview</td></tr>
<tr><td>・Composition of organization and responsibilities
・Organization polices/ objectives</td><td>Documents</td><td>III. Education/training</td><td>・Education, training organization
・Planning and implementing education/training
・Methodology (technology transfer)
・Qualification certifications</td><td>Documents</td></tr>
<tr><td rowspan="3">PM</td><td rowspan="2">I. Organization/ management</td><td rowspan="2">・Quality assurance program
・Cultivating safety culture
・Activities aimed at improving morale
・Safety initiatives and their evaluation</td><td rowspan="2">Documents</td><td>IV. Design/transport/ maintenance management</td><td>・Effective transport management
・Effective maintenance management
・Effective design management</td><td>Documents</td></tr>
<tr><td>V. Emergency preparedness</td><td>・Emergency plan and training (including observation of location for emergency countermeasures</td><td>Documents</td></tr>
<tr><td>V. Important items</td><td>・Activities to prevent human error</td><td>Documents</td><td>V. Important items</td><td>・Initiatives to improve reliability of transport facilities
・Radiation control during transport</td><td>Documents</td></tr>
</table>

- Review Implementation Schedule at Rokkasho Transport Operations Office

		Group A (organization/operations, important items (portion))			Group B (education/training; emergency preparedness; design/transport/maintenance management; important items (portion))		
Wednesday, July 18	AM	Opening (greetings, member introductions, explanation of recent status of Operations Office) (60 minutes) *1					
	PM	I. Organization/ management	Operations Office Director class ・Organization policies/objectives ・Leadership	Interview	IV. Transport/Maintenance Management	Interview of manager class ・Effective design management ・Effective transport/maintenance management	Interview
						Interview of personnel class ・Effective design management ・Effective transport/maintenance management	Interview
			Manager level class ・Leadership (-initiatives/awards objectives -clarification of scope of responsibilities -conveying safety messages) ・Quality assurance program -Safety initiatives ・Co-existing with society -Activities in the local community to promote understanding	Manager class Interview/documents	III. Education/training	・Education/training plan and implementation ・Methodology (technology transfer) ・Qualification certifications	Documents

- Review Implementation Schedule at Rokkasho Transport Operations Office (continued)

		Group A (organization/operations, important items (portion))			Group B (education/training; emergency preparedness; design/transport/maintenance management; important items (portion))		
Wednesday, June 18	PM	I. Organization/ Management	・Reflection of past nonconformities	Documents	IV. Transport/Maintenance Management	・Effective transport management	Documents
			・Initiatives for labor safety ・Reflection of past nonconformity cases	On-site	III. Education/training IV. Transport/maintenance management	・Sites for education/ training activities ・Transport worksite	Worksite
		Review results/confirmation of plan for following day					
Thursday, June 19	AM	Event observation	Meeting	On-site	Event observation	Meeting	On-site
		I. Organization/Management	・Composition of organization/responsibilities/ ・organization policies/objectives ・Cultivating safety culture ・Activities aimed at improving morale ・Initiatives for labor safety and their evaluation	Manager class interview/ documents	IV. Transport/ maintenance management	・Effective maintenance management	Documents
					V. Important items	・Initiatives for improving reliability of transport facilities ・Radiation control during transport	Documents
		V. Important items	・Human error prevention	Manager class interview/ documents	I. Emergency preparedness	・Emergency plan and training	Documents
			・Measures to prevent human error	On-site	IV. Transport/maintenance management	・Emergency countermeasures locations ・Maintenance management sites	On-site
	PM	I. Organization/ management	Personnel class ・Cultivating safety culture, activities aimed at improving morale	Interview	IV. Transport/maintenance management	Personnel class ・Effective transport management ・Effective maintenance management	Interview
		V. Important items	Person responsible class ・Initiatives for preventing human error	Interview	II. Emergency preparedness	Personnel class ・Dissemination of emergency preparedness	Interview

		Fact confirmation ・Coordination with host ・Writing closing report
Friday, June 20	A M	Fact confirmation Final coordination with host/final revision of closing report
		Closing preparations (copying of documents, preparing venue)
		Closing (explanation of results, closing address)

6. Review Method, Review Items, and Summarizing Review Results

The following explains review method, review items and how review results were summarized.

6.1 Review Method

(1) Document review

Documents for each review item were explained, presented and then reviewed.

(2) Interviews

The company president who is the top of management, the head of the Rokkasho Transport Operations Office, managers and general employees were interviewed under the theme of “initiatives for nuclear safety, etc.” Further, questions were asked with respect to reviewed documents.

(3) Site observation

Team reviewed NFT activities by observing closely how NFT personnel conduct activities on site in conjunction with the result of document reviews and interviews.

Furthermore, team proactively developed mutual communication with NFT by providing beneficial information and examples like best practices in industry during document reviews, interviews and observations.

6.2 Review Items

The review items are the four areas of “organization/management”, “emergency preparedness”, “education/training”, and “design, transport, and maintenance management”; and “initiatives for safety during transport” and “human error prevention”.

6.3 Summarizing Review Results

For each review item, document review, interviews and site observations are conducted, and good practices and areas for improvement are extracted.

Here, a “good practice” is a case “among activities to ensure safety at the Operations Office that has implemented an appropriate, effective and unique method, and that JANTI members wish to further convey to the nuclear power industry and that is an excellent case study.

An “area for improvement” is “a matter that seen from the perspective of aiming to bring

nuclear safety to the highest standard, a proposal or the like that references best practices in the nuclear power industry for further improvements in activities to ensure safety at the Operations Office.” Therefore, some cases, even if the current state of activities is at or above general standards in the nuclear power industry, may be used as a subject for an area for improvement.

7. Overview of Review Results

The NFT “management principles” that serve as the fundamental policies behind company activities in nuclear fuel transport specify that “ensuring safety” is one of the four pillars and “ensuring safety as the utmost priority and improving work quality levels” are goals for specific awareness and at the action level. Moreover, the company president appeals vigorously to employees that “safety first” is always prioritized over “costs”, and it was confirmed that employees of NFT, under strong leadership, are making aggressive efforts to develop a safety culture and respond to issues.

Specifically, the following were confirmed to be steadily moving forward (1) activities to prevent deterioration by resin data falsification issues in the transport container manufacturing stage, (2) activities to cultivate a safety culture in ocean shipping companies that operate newly constructed ships, (3) transfer of technical information obtained from experience of transport and maintenance and shared general development, and (4) tightened management related to transport and maintenance, etc.

However, further improvements are desired for (1) associating procedure manual improvement history column with nonconformity details and (2) preventing human error.

The following is an overview of the interview with the company president and an explanation of the 6 good practices and 2 areas for improvement that were extracted from the results of this review.

Note that these improvement items are not matters for which immediate response is required from the perspective of nuclear safety.

The following is a summary of the interview with the company president.

(1) The people directly carrying out roles with respect to safety are the 115 employees of the company and all of the employees at the affiliate companies. “Safety first” is not just a mantra but must be emphasized as a stance. Safety first must be conveyed to employees who are on the responding side. No matter how diligent I am, the responding side must be knowledgeable. Consequently, education, training and securing human resources are required, and we have no regrets over costs for education and training.

(2) To date, we have poured the most effort into matters related to safe shipping on newly built transport ships. With respect to shipping on newly built ships, instead of shipping with a shipping company that we have asked in the past, we have begun asking a new shipping company to handle the shipping. And, while our company collaborates with these new shipping companies, we start with asking “What is nuclear power safety?”

Through various activities, we aim to establish a nuclear power safety culture into every part of the shipping company. Consequently, I feel that all employees of the new shipping company come to have a deep understanding of what nuclear power safety culture is, and that we have instilled a nuclear power safety culture in the new shipping company.

(3) Ethical issues such as the resin data falsification[5] in the transport container manufacturing stage are important issues. In light of this, we have set October 6 of each year as a “review date” and invite speakers to talk about safety.

(4) At the Mutsu-ogawara Port in Rokkasho-mura, Aomori Prefecture, we substantially operate with only one berth. In the future, because of increases in the amount of spent fuel, waste, MOX and plutonium being shipped, the berth will become extremely congested. Moving forward, if measures are not established that anticipate the next five to ten years, the nuclear fuel cycle will fail to operate as it should. Top management at power companies also need to be aware of this matter.

(5) Operations will expand over the next five to ten years, and in that time technical capability and human resources must be developed. Each year, the company hires two or three new people, but since that is not enough, staff is secured by head-hunting for people who can adapt strategically. In-service periods for equipment that are at critical points such as cranes and shipping containers have been extended, and the amortization period has ended, but it is still necessary to invest in preventive activities such as preventive maintenance.

(6) Peer reviews are considered a good chance to not become close-minded.

7.1 Good Practices

(Organization/management)

(1) **Development of health management for employees as quality objective**

The Rokkasho Transport Operations Office has many employees who need to take health management measures. Resolving this issue is considered an urgent task, and from the perspective of ensuring human resources, development of such resolutions is a quality objective. Specifically, persons needing some kind of treatment are given individual guidance by an industrial doctor. In addition, from FY2007, for a “patient-to-be of lifestyle-related illnesses” not yet having reached treatment, “an exercise, nutrition and individual program” is developed by a specialized medical institution.

(2) **Activities to prevent deterioration by resin data falsification issues in the transport container manufacturing stage (October 6, 1998)**

October 6 each year has been established as a “review day”, a lecture on ethics is given by the company president along with presentations on the narrative of the data falsification issue and lecture meetings with prominent persons who have a deep and detailed knowledge of corporate crisis management. Further, to increase corporate ethics awareness higher from FY2006, themes closely related to the worksite have been selected and informal gatherings are held at the worksite. At the Rokkasho Transport Operations Office, all of the participants discuss “how things should be”, analysis of one’s own current situation with respect to such discussion, and problems are extracted. Moreover, specific measures for those problems are evaluated as a part of ongoing activities so that resin data falsification issues in the shipping container manufacturing stage are not allowed to simply be forgotten.

Note that, this fiscal year, new initiatives have been planned to review what the fundamental causes were such as through lectures by relevant persons, etc. so as to instill awareness. Furthermore, from FY2006, a structure for manufacturing management attached to Engineering Section has been set up that is concerned with manufacturing of new spent fuel shipping containers.

(3) Activities to cultivate a safety culture in ocean shipping companies that operate newly constructed ships

With respect to overseas shipping companies that operate newly constructed ships, while confirming in advance the technical capability, costs, permit acquisition status, etc., education on the special characteristics of nuclear power (safety culture, radiation handling work, safety in shipping, etc.) is conducted for approximately two years, and the level of understanding is confirmed by questionnaires, and issues in shipping are mutually reviewed. A safety culture is thereby instilled.

(Emergency preparedness)

Establishment of an Emergency Preparedness Office

An Emergency Preparedness Office has been established in NFT, and, during emergencies, an emergency preparedness head office is opened with the company president as the director-general. Furthermore, emergency alert notification training and the like are also conducted. Here, information such as the position of ships, images of ships, images of Mutsu-ogawara Port, radiation management data, etc. can be grasped in real-time and information shared.

(Education/training)

Transfer of technical information obtained from experience in shipping and maintenance and common general development

Design fundamentals concerning the design of shipping containers and Q&A collections related to inspections before shipping with respect to maintenance of shipping containers are prepared and technology transfer carried out. Furthermore, information of matters related to quality etc. that occur in maintenance are recorded on an information sheet and shared among relevant persons in shipping container maintenance at the head office and the Rokkasho Transport Operations Office. Such information is stored and entered into a knowledge bank, and made easy to search.

(Education/training, design, transport, maintenance management)

Thorough management related to transport and maintenance

Management related to shipping and maintenance at the Rokkasho Transport Operations Office is in a favorable state. Regarding shipping, all employees in addition to related employees including persons in charge, security and operators of affiliate companies (including persons the company plans to hire) receive a broad education covering nuclear power fundamentals, radiation management, inspection technology and so on.

Further, survey equipment, dosimeters and protective gear related to radiation management are being managed in an orderly fashion, packaged and prepared for each duty so they can be taken with certainty. History management is thoroughly carried out for necessary parts for maintenance management of spent fuel shipping containers right down to small items such as bolts, washers and gaskets.

(Important items)

None in particular

7.2 Areas for improvement

(Organization/management)

Association of Procedure Manual Revision History with Nonconformity Details

Processing nonconformity corrections was such that, upon procedure manual revisions, descriptions of nonconformity details were not described in the revision history or were not cited in nonconformity reports. To make the details of nonconformities up to revision easier to understand, it is desired that these be described in the revision history section of the procedure manual or be cited.

(Emergency preparedness)
None in particular.

(Education/training)
None in particular.

(Design/transport/maintenance management)
None in particular.

(Important items)
(Human Error Prevention)
Active use of data such as know-how and near-miss data to prevent human error
From March 2007, to create data from near-miss incidents and aim for effective use thereof, the company has started a trial stage and has posted the data on the company network and will try to use such data in safety meetings or crisis prediction activities or the like. It is desired that items including know-how and near-miss data and the like are reflected even more in work guidelines (instructions), and that a database be made from this and that data be used effectively.

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[1] Spent fuel: Fuel in a nuclear reactor that has been used for a specific period then removed. Because the removed fuel contains, in addition to uranium, radioactive materials such as fission products created from the fission of plutonium and uranium after the uranium has absorbed neutrons, both radioactivity and decay heat from the fission products are high. Consequently, spent fuel is stored for a number of years in a spent fuel storage pool to decrease the radioactivity and lower the decay heat. Japan has a policy to reuse plutonium contained in spent fuel of light-water reactors; therefore, spent fuel is later transported to a reprocessing plant. To date, the majority of spent fuel has been processed at reprocessing plants in England and France, but now spent fuel will be reprocessed at a reprocessing plant under construction in Rokkasho-mura, Aomori Prefecture.

[2] Low-level radioactive waste: This term is broadly applied to general radioactive waste excluding high-level radioactive waste (primary waste liquid and solids of spent fuel reprocessing). Here, the term refers to low-level radioactive waste generated by nuclear power stations that is solid or solidified containing nuclides at a low level with a comparatively short half-life that can be disposed in shallow ground (disposal of radioactive waste in shallow ground having a depth of approximately several meters of topsoil that provides a final natural barrier), To date, waste subject to such disposal is waste of concentrated liquid, etc. solidified to be homogeneous and uniform with cement or the like and miscellaneous solid waste such as metal that has been form-filled with cement.

[3] Returned vitrified waste: Currently a portion of the spent fuel of nuclear power stations is reprocessed in Japan, but other waste is outsourced to reprocessing companies in England and France. For reprocessing and reused, the uranium and plutonium are separated and recovered. High-level radioactive waste generated in this reprocessing step is vitrified and sealed in stainless steel containers known as canisters. This vitrified waste has been returned to Japan and stored successively from 1995 in accordance with the Reprocessing Outsourcing Agreement. Such waste is known as returned vitrified waste.

[4] Natural uranium hexafluoride: A fluoride of natural uranium. Uranium hexafluoride at room temperature and normal pressure is a colorless crystal. Because it sublimates at 56.5°C and becomes a gas, isotope separation of the uranium (uranium concentration) is used. While natural uranium hexafluoride does not react with oxygen or air, it reacts strongly with water, generating hydrogen fluoride. The resulting hydrogen fluoride is extremely corrosive and also very toxic to living organisms. When shipping, the state of natural uranium hexafluoride is taken into consideration, and fireproof and shock-proof characteristics are fully ensured when attaching protective gear and heat resistant covers, etc. of valves

[5] Resin data falsification in the shipping manufacturing stage: In the manufacturing stage of shipping containers to be used for transporting spent fuel to Rokkasho, an investigation of NFT and the then Genden Koji K.K. found that chemical analysis data of resin for use in neutron shielding was rewritten by Genden Koji, an affiliate company of the shipping container manufacturer, and this was disclosed on October 9, 1998.