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Summary Report of Peer Review

(Provisional Translation)

Place of Review: **Tamano Works**
Mitsui Engineering & Shipbuilding Co., Ltd.
(Tamano-shi, Okayama Prefecture.)

Date of Review: February 18 to February 20, 2003

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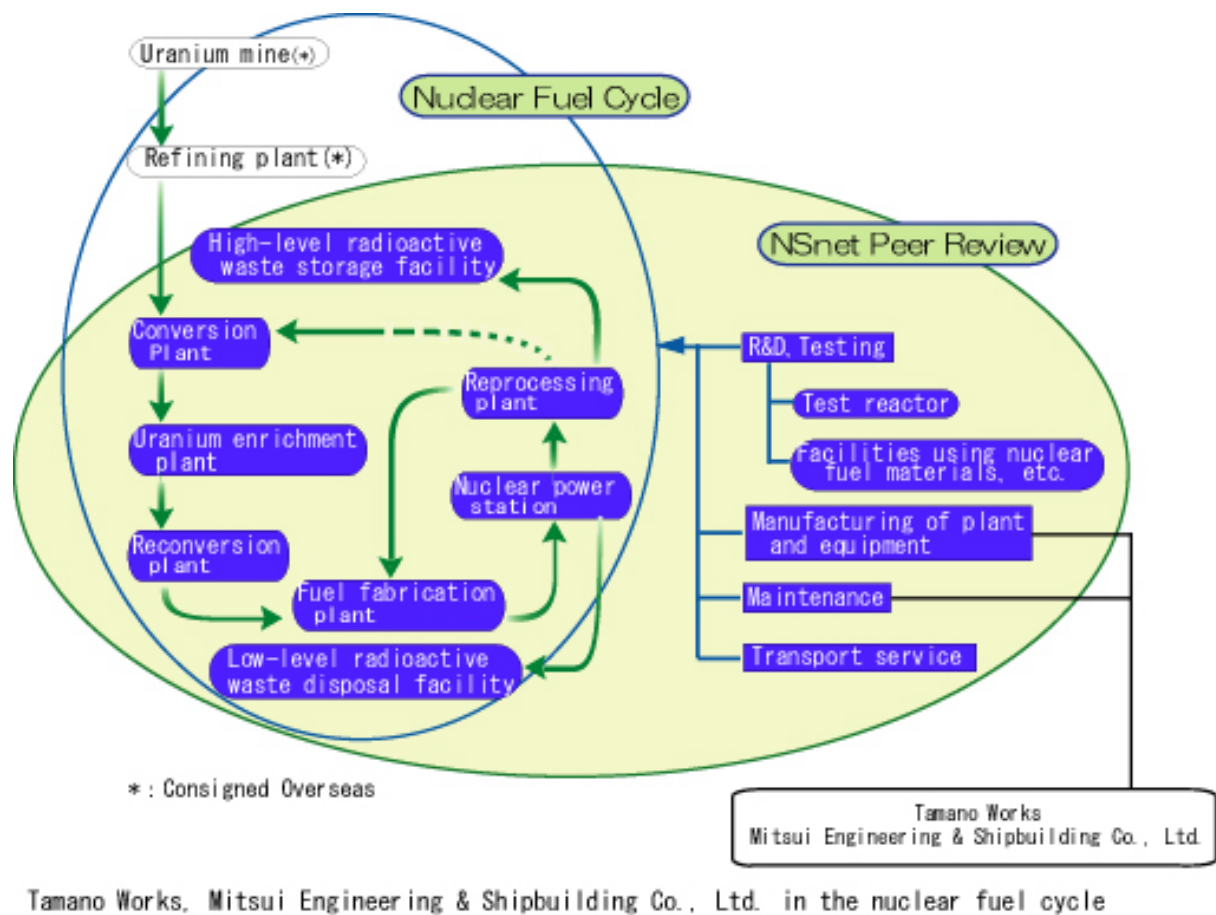
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1. Objectives

The purpose of the NSnet peer review (hereafter referred to as “review”) is to achieve an improvement in the “safety culture” of the entire nuclear power industry by sending review teams of member specialists to member facilities, where they conduct reciprocal evaluations on common nuclear safety subjects among members and share mutual knowledge about the horizontal progress of good practices as well as subjects that have been singled out.

2. Summary of Facility Operations



Mitsui Engineering & Shipbuilding Co., Ltd. (MES) is a general heavy industries company involved in such businesses as shipbuilding. As a nuclear-related business, it became the first to develop a nuclear-powered ship in 1957. Its main business is currently related to nuclear fuel recycling such as spent fuel reprocessing, radioactive waste disposal, and transport/storage containers (casks¹), etc. It is engaged in activities ranging from research and development to

plant facilities and after-care services, etc. Tamano Works manufactures various product groups from new shipbuilding to various plants and new products in the future, but its nuclear related business involves making a variety of products such as casks, structure for nuclear reactor foundation, shielding containers for highly radioactive materials, spent fuel transport ship, etc.

The nuclear-related business of MES are handled by the Nuclear Energy Systems Division in the Tokyo/Kasai Center and involves engineering work such as basic design, safety analysis, research and development, procurement, construction, quality assurance and post-delivery services of nuclear related equipment and devices.

Among the nuclear related products designed by the Nuclear Energy Systems, major products such as casks are handled by the Machinery Factory Industrial Machinery Sub-Division (hereafter referred to as the Machinery Factory (Industrial Machinery) at Tamano Works and detail design, materials procurement, fabrication and inspections are conducted based on the basic designs and specifications of the Nuclear Energy Systems Division.

Tamano Works was the birthplace of MES, which began business as the Shipbuilding Division of Mitsui & Co., Ltd. in 1917. It separated from Mitsui & Co., Ltd. as Tama Shipbuilding Co., Ltd. in 1937 and changed its name to Mitsui Engineering & Shipbuilding Co., Ltd. in 1942, by which it operates now. Of the over approximately 3,700 employees at MES, over approximately 1,900 are placed at Tamano Works. Almost all of the company's business is inter-related, with MES positioned as a core.

Machinery Factory (Industrial Machinery), on the other hand, since it began manufacturing equipment for various plants such as oil refineries in 1938, has expanded its operations in the nuclear power field with desalination equipment for nuclear power stations in Japan in 1975, followed by heat exchangers for nuclear power stations in the U.S. and Mexico, casks and so on. Currently, about 140 employees are engaged in this works.

3. Points of Review

3.1 Target of review

The target of this review is the safety promotion activities involving design and fabrication of casks at Tamano Works, MES.

3.2 Points of Review

Among the nuclear related activities carried out at Tamano Works, the review concentrated on activities related to nuclear safety carried out in the stages of design and fabrication of casks,

with the aim of demonstrating functions required from the perspective of nuclear safety (including related occupational safety) in the machinery, equipment and systems that are designed and fabricated.

The review was divided into four sections: (1) Organization/Administration, (2) Education/Training, (3) Design/Manufacture, and (4) Handling of important issues. It was carried out with a focus on the nuclear industry's best practices.

Of these, the reviews were carried out with a focus on, (1) in Organization/Administration, "composition of organization and system of responsibility" and "specific activities related to fostering a nuclear safety culture and improving morale", (2) in Education/Training, "Certification of Qualification", "education and training planning" including technical and skill dissemination, (3) in Design/Manufacture, "management regulations and the observance of these regulations," "design management," and "manufacture planning and management", and (4) in Handling of important issues, "cooperative activities related to safety with cooperating companies" and "incorporating examples of problems related to design and manufacture."

In addition, following the data falsification problem regarding neutron shielding materials (resins) for spent fuel transport containers in 1998 (hereafter referred to as the "Data Falsification Problem" and the "problem of voluntary inspection data falsification at a nuclear power station" and the "problem involving leakage test of reactor containment vessel" discovered in 2002 (hereafter referred to as the Voluntary Inspection Data Falsification Problem, etc.), the review also paid attention to ethics, communications, and data handling.

4. Period and Outline of Review

(1) Date

February 18(Tue.) to February 20(Thu.), 2003

(2) Formation of Review Teams

A group: Kyushu Electric Power Co., Inc., Nuclear Fuel Industries, Ltd.

B group: Central Research Institute of Electric Power Industry, NSnet Office

Coordinators: NSnet Office

(3) Fields of Responsibility

A group: Organization/Administration, Education/Training

B group: Design/Manufacture, Handling of important

5. Schedule of Review

The review was carried out over a three-day period for each field according to the schedule shown below.

		A Group		B Group	
2/18 (Tue.)	A M	Opening (Greetings, Members Introduction, explanation of plant facilities, work summary, etc.)			
		1. Organization/ Administration	< Director > [Interviews] - Effective organization and management [Document Examination]	3. Design/ Manufacture	- Design management [Document Examination] - Manufacturing management [Document Examination]
	P M	2. Education/ Training	- Training facilities [Field Observation]	3. Design/ Manufacture 4. Handling of important issues	- Manufacturing Division [Field Observation]
		1. Organization/ Administration	- Safety culture [Document Examination]	4. Handling of important issues	- Nuclear safety [Document Examination]
2/19 (Wed.)	A M	2. Education/ Training	- Qualification certification - Planning and implementation [Document Examination]	3. Design/ Manufacture 4. Handling of important issues	< Manager class > < Responsible persons (Worker)> [Interviews]
		1. Organization/ Administration	< Manager class > [Interviews]		
		1. Organization/ Administration 2. Education/ Training	< Responsible persons (Person in charge)> [Interviews]	4. Handling of important issues	- Reflecting Nonconformities [Document Examination]
	P M	Verification of Facts		Verification of Facts	
2/19 (Thu.)	A M	Verification of Facts			
		Closing			

6. Methods and Items of Review

6.1 Methods of Review

The review looked at activities related to nuclear safety at Tamano Works, and extracted good practices and suggestions for improvement through the following field observations, indicated document examinations, and discussions and interviews based on the same.

In addition, communication about nuclear safety culture took place during the review process, including exchanges of opinions based on the provision of information deemed valuable from the review teams.

6.1.1 Execution of Review

(1) Field observations

For the field observations, direct observations of how actual activities are implemented for the items confirmed in the interviews and documents were conducted with investigations based on the experience and knowledge of the reviewers.

(2) Document examinations

For the document examination, the review was conducted through requesting necessary relevant documents based on explanations regarding related documents for each review item. Following the plant and field observation, documents related to the observation were required, and more detailed investigations were carried out.

(3) Interviews

Interviews based on the following objectives were conducted with general manager of machinery factory, managers and responsible persons.

- (a) Examining the level of the effort and awareness about the fostering of the safety culture including nuclear safety measures
- (b) Gathering additional information not confirmed in the documentation
- (c) Questions and answers including those arising from document examination
- (d) Evaluating the level of understanding about the determined items and the responsibilities imposed on each member
- (e) Evaluating whether the determined rules are being implemented or whether they are merely carried out in name only.

6.1.2 Standpoint for selecting Good Practices and Suggestions for Improvement

(1) Good Practices

Information on good practices incorporating appropriate, effective, and unique methods into activities to ensure safety should be widely distributed to the members of the NSnet and the nuclear industry.

(2) Suggestions for Improvement

After comparing the practices of Tamano Works with the best in the nuclear industry, suggestions to improve and enhance safety activities should be implemented so as to achieve the highest level of nuclear safety.

Even if current activities are equal to or higher than general standards in the nuclear industry, suggestion is taken up in case there is still room for improvement.

6.2 Items of Review

The Field observations and confirmations, document examinations, and interviews were carried out based on the review items shown below. The results were evaluated and organized in the Itemized Results, and those were summarized as the Main Conclusions.

Section 1: Organization/Administration

Investigations were conducted from the perspective of whether organizational composition and accountability are clear, whether targets have been established related to guaranteeing nuclear safety, and whether activities are being conducted involving the fostering of safety culture and the improvement of morale (for example, ethics-related programs, systems and culture in which internal opinions are heard and accepted with sincerity).

Review items

- (1) Effective organizational and management
 - a. Organizational composition and responsibility system
 - b. Securing of appropriate personnel
 - c. Organizational policies and targets
 - d. Leadership of managers
- (2) Activities involving the fostering of safety culture and improving morale
 - a. Concrete activities related to fostering safety culture
 - b. Concrete activities related to improving morale
 - c. Activities for creating harmony with local communities

Section 2: Education/Training

Investigations were conducted from the perspective of whether, for technicians and engineers involved in design and manufacture, a qualification certification system was established and operational, and whether skill improvement, nuclear-safety-related education and training, and technical and skill dissemination were being conducted appropriately.

Review items

- (1) Qualification certification
 - a. Qualification certification system and qualification standards
- (2) Planning and carrying out education and training
 - a. Planning of education and training (Technical and skill dissemination)
 - b. Carrying out education and training

Section 3: Design/Manufacture

Investigations were conducted from the perspective of whether personnel, time frames, and work environments were guaranteed for casks, whether design and manufacturing management regulations were being observed, and whether the various types of design and manufacturing management were being carried out properly.

Review items

- (1) Effective design management
 - a. Design organization
 - b. Design management regulations and observance of these regulations
 - c. Design management
- (2) Effective manufacturing management
 - a. Manufacturing organization
 - b. Manufacturing management regulations and observance of these regulations
 - c. Equipment maintenance
 - e. Manufacturing planning and management

Section 4: Handling of important issues

Investigations, as efforts related to important issues of nuclear safety, were conducted on cooperative activities related to safety with cooperating companies, quality assurance program, prevention of human error, and activities to prevent reoccurrences of nonconformities.

Review items

- IV-1 Efforts toward nuclear safety
- (1) Cooperative activities related to safety with cooperating companies

- a. Appropriate communication with cooperating companies (relating to the promotion and improvement of safety culture)
- b. Evaluation of cooperating companies
- (2) Quality assurance
 - a. Establishing a quality assurance system
 - b. Effective auditing system
 - c. Handling of the data falsification issue and so on
- (3) Efforts related to product safety
- (4) Labor safety (including radiation management)

IV-2 Incorporation of examples of problems related to design and manufacture

- (1) Nonconformities prevention activities
 - a. Activities for the prevention of human error
 - b. Activities for the prevention of Nonconformities reoccurring

7. Main Conclusions

In summing up this review of Tamano Works, we have not found any item in the nuclear safety field that would lead to a serious accident unless immediate remedies were taken.

The Tamano Works Machinery Factory accepts the company management principle of “creating value beneficial to society on a global stage with all of our various technology cultivated from tradition and sensitive collective strength” and the Tamano Works slogan of “No Change No Chance, Less Waste, Faster and More Customer-focused.” The Factory is taking active initiatives to implement BPSⁱⁱ activities and Trouble Case Study Activityⁱⁱⁱ etc., in order to respond rapidly to changes in the company environment. Through these various kinds of activities, organizational and personal reform activities are being developed for all employees that realize the Factory’s slogan of “Let’s Build a Factory that matches Safety with QCD (Quality, Cost, Delivery)”.

The Machinery Factory (Industrial Machinery) is establishing quality-related policies in its “Quality Assurance Plan” prepared for each nuclear job and is aiming for improvements in quality, technology, nuclear safety and labor safety through various activities that are outlined in each paragraph. When manufacturing NFT-type transport containers^{iv} (casks), the Machinery Factory (Industrial Machinery) is also disseminating the nuclear safety culture to the general public by showing initiatives for nuclear safety of equipment manufacturer actually at Factory on site to a large number of visitors from various organizations in Japan and overseas.

Concerning the Data Falsification Problem and the Voluntary Inspection Data Falsification Problem, etc., the presence or absence of falsified data in general inspections in cask-related documents and records and periodic voluntary inspections of casks is being confirmed quickly together with Nuclear Energy Systems Division. That there is nothing inappropriate is also being confirmed.

In January 2003, the president presented a “Compliance Statement” that established guidelines to set “Compliance Management Regulations”. These are thoroughly publicized in the company by viewing by PC_≡ and a pamphlet which was distributed to all company employees that also included company activity standards.

Concerning improvements in product quality, each section chief and person responsible are implementing joint QC patrols twice a month and joint inspections shipment^v on every job. Product quality is confirmed by these inspections of multiple sections to provide products with customer’s satisfaction.

In the area of education, the Machinery Factory (Industrial Machinery) extended Trouble Case Study Activity from having only the management level to broadening the scope to have all employees participate, up to general engineers who inquire into the real reasons for nonconformities and make countermeasure proposals. Together with preventing reoccurrence, Machinery Factory aims to improve the technology and morale of all its engineers.

For affiliated companies within Tamano Works and on the outside, guidance takes place in terms of technology and health and safety. Education concerning nuclear safety is also thoroughly implemented and Tamano Works and affiliated companies work as one in safety activities.

In the future, Tamano Works, not satisfied with the current situation, hopes to continue its voluntary efforts further in aiming to improve its safety culture even more. We have high expectations that the successes seen in this review will be developed not only at Tamano Works but at its affiliated companies as well.

In this review, we have found some good practices that should be introduced not only to other NSnet members, but also widely to the nuclear industry. The good practices are described below.

Implementation of effective preventive safety activities utilizing “monitoring sheets”

All employees of the Quality Assurance Department (Industrial Machinery) and the Industrial Machinery Engineering Division staff patrol the shops twice every day, monitoring the manufacturing status, progress status and so on as well as noting on a “monitoring sheets” improvement requests concerning quality, design and safety on a case-by-case basis as obtained by the tours and then reporting to the related departments or sections.

These activities are conducted dynamically as activities to prevent nonconformities, before it grows out of control. The monitors discover improvement items concerning quality, etc. in each process that workers do not notice themselves, record those improvement items on the sheet and report them, aiming for level development throughout the company.

Activity policy dissemination and objective achievement management by implementing “Safety Improvement Activities”

Concerning health and safety management policies and objectives, various sections in the Manufacturing Department conduct “Safety Improvement Activities”. This involves monthly meetings of each section’s health and safety committee to inspect, confirm and evaluate the prior month’s activity implementation status and establish the current month’s important activity themes, specific measures and target values. These are all noted in a “PDCA Aim Control Sheet” and the activity status is reported to the Tamano Works General Affairs Division Health and Safety Section.

The “PDCA Aim Control Sheet” is reported to the Tamano Works Health and Safety Committee meeting held every month, at which the status of dissemination of activity policies and achievement status of objectives is confirmed.

Implementation of reforming organizational awareness through “Reformational Manager Class Training Activity”, etc.

“Reformational Manager Class Training Activity” are conducted for the management level that aim to improve awareness and recognition of reforms, discover problem points and improve skills to make countermeasure proposals, etc. Successes are introduced in announcement meetings in an aim to have successes develop evenly throughout the company.

These training activities have people consider what form an organization should take and, as managers and as general employees, what the structure should do. The activities are considered extremely useful for transforming the awareness of employees and moving them to action.

Initiatives for product safety by joint QC patrols

Joint QC patrols are conducted appropriately by the quality assurance activities in the Machinery Factory (Industrial Machinery) and are implemented by managers of the related departments or or persons in charge to check on problems with product quality. They confirm the status of observing work processes, such as that products are being manufactured correctly according to the drawings and fabrication procedure, etc., and the presence or absence of nonconformities during manufacturing, abnormalities in equipment, etc. The results are clarified in meeting minutes and sound follow-ups are being made.

Confirmation of daily safety objectives by workers themselves

At the daily morning meeting, workers one by one write on the work board at the shops their safety objectives for their own work that day. This is useful in preventing near misses and accidents by having workers self-aware of their intention to work safely and by having them look into the work process.

Activities to reduce troubles through company-wide BPS activities

BPS stands for Best Practices Sharing and is system that, as a company-wide activity, aims to learn from the good practices in other sections, raise problem-solving capability and transform the organizational structure with level development across departments with good cases presented through announcement meetings..

Nonconformities and troubles -reduction measures taking place in divisions is taken up as a theme and reported on a company-wide level. At Machinery Factory (Industrial Machinery), a database on nonconformities reports with these reported cases in other divisions. With the objective of preventing similar problems, a “Map of Problems during Manufacture” is being created to allow for easier understanding of important points in cases of troubles during manufacturing at shops and the activity status is being introduced at company-wide BPS announcement meetings.

The following represent proposals toward the further improvement of the safety activities of Tamano Works.

Using color illustrations, etc. as educational training materials to promote further understanding of nuclear safety

Education and training is being implement that uses training materials compiled on the functions and importance of nuclear related products and cites case examples of past nuclear accidents, nonconformance, misconduct and so on. This is proving useful in having people fully aware of the nuclear related products and in cultivating a nuclear safety culture. Considering the large amount of specialized terminology and special products related to nuclear products, we hope that effective methods in making educational training materials will be used, such as making wide use of easy-to-understand color illustrations, in order to further promote understanding of nuclear safety.

Further ideas for shop displays, etc. outlining emergency contacts

The emergency contact point and contact procedures and so on when an occupational disaster or fire happens at shop are established and the overall schematic of such emergency contact is posted at the shop. However, when needing to confirm immediately what to do at the shop, the overall schematic is too detailed. The contact items from the site are posted in front of

the fixed phone in the site lounge, but given that it doesn't ordinarily stand out and that people carry mobile phones, it is desired that what must be first done be narrowed down and displayed on-site and ideas such as distributing a pocket card to all employees be implemented that will be useful in speeding up contact during emergencies. Considering cases of nonconformities at other companies as well, we feel that the effectiveness of shop displays can be further improved through ideas that catch the attention of workers such as enlarging warning points and using color.

Thorough implementation of increased safety management for facilities handling RI^{vi}

While RI is handled 100% by investing affiliated companies, when any sort of problem involving RI occurs, the possibilities are great for problems overall including parent companies and affiliated companies given the special characteristics of RI. We hope that Tamano Works not be satisfied with the current situation and aim for thorough safety management that further clarifies restricted use items for the Linac^{vii}.

Other details concerning this report may be found on the Japanese website.

ⁱ Cask: Used as a common name to refer to the transport and storage containers of radioactive materials.

ⁱⁱ BPS activities: BPS stands for Best Practice Sharing. The system aims to learn from the good practices in other sections, raise problem-solving capability and transform the organizational structure. It aims to learn from the good points in other sections, raise problem-solving capability and transform the organizational structure with level development across divisions with good cases presented through announcement meetings.

ⁱⁱⁱ Trouble Case Study Activity: While these were initially only implemented for the management level at Machinery Factory (Industrial Machinery), it currently also includes general engineers. Specifically, the management level and general engineers are divided into four teams and analyze problems, investigate real causes and make proposals for reoccurrence prevention measures. The announcement meetings are held monthly, changing theme. Improving the problem solving capability of engineers is aimed for with these activities.

^{iv} NFT-type transport containers: Casks owned by Nuclear Fuel Transport Co., Ltd. These are containers for the transport of spent fuel of light-water nuclear power stations. There are six types with fuel type for transport (BWR, PWR), handling restrictions of power stations and transport efficiency in consideration. They are mainly used for transport to nuclear fuel cycle facilities of Nuclear Fuel Ltd. in Rokkasho, Aomori Prefecture.

^v Joint Inspection before shipment: The general manager of machinery factory, managers of the related departments and sections and persons responsible for manufacturing conduct joint inspections before products are shipped. Under the responsibility of the Quality Assurance Department, final quality confirmations are made and the Quality Assurance Department (Industrial Machinery) Chief Issues permission for shipment.

^{vi} RI : Radio Isotope

^{vii} Linac: An electron accelerator used and disseminated as high-energy X-ray equipment for non-destructive inspections. With the largely permeable high-energy X-ray radiation source, it used for welding inspections, etc. of large constructions such as pressure vessels. It is based on electron accelerator developed for use in nuclear physics research.