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Summary Report of Peer Review

(Provisional Translation)

Place of Review: Ariake Machinery Works
Hitachi Zosen Corporation
(Hitachi Zosen Diesel & Engineering Co., Ltd.)
(Nagasu-machi, Tamana-Gun, Kumamoto Prefecture)

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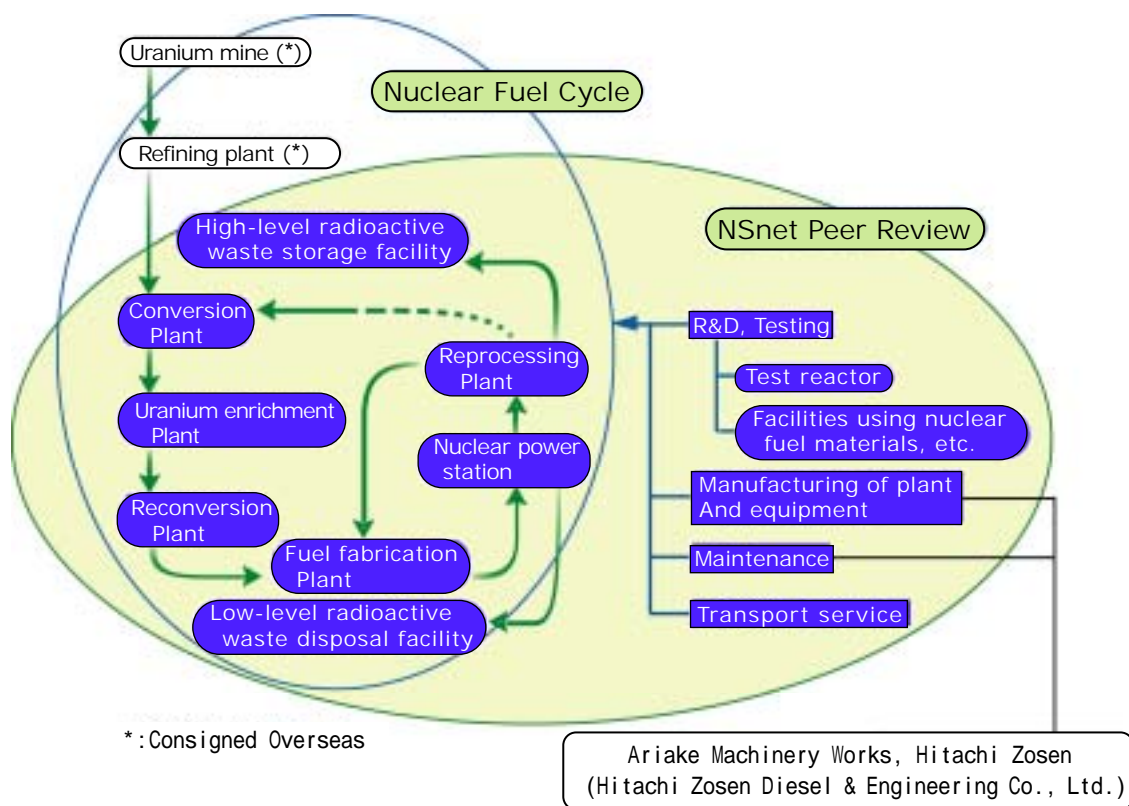
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1. Objectives

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



Ariake Machinery Works, Hitachi Zosen Corporation (Hitachi Zosen Diesel & Engineering Co., Ltd.)
in the nuclear fuel cycle

Hitachi Zosen (hereafter referred to as “Hitz”) has been involved in the design and manufacture of nuclear-power related machinery and equipment since it began developing a nuclear-powered ship in 1956. In the spent fuel transport/storage containers (casks)ⁱ field in particular, since its delivery of the first cask produced in Japan in 1978, the HZ-75Tⁱⁱ cask, it has delivered 41 such casks for light-water reactor fuel transport all over the world. In recent years, the company has delivered over 160 spent fuel storage containers and canistersⁱⁱⁱ

in Japan and the U.S.

Although nuclear-related equipment had been manufactured mainly at Sakurajima Works in Osaka, the business was transferred to Kyushu (Ariake) in 1997 and Ariake Machine Works has been manufacturing such equipment under the ISO9001^{iv} quality assurance system. In 1999, Ariake Machine Works was spun-off into Hitachi Zosen Diesel & Engineering, Ltd. (hereafter referred to as “HZD&E”). It has the most advanced equipment and is also engaged in the design and manufacturing of motors centering on marine diesel engines in addition to nuclear equipment. HZD&E has a main office and plant (hereafter referred to as the “Operation”), which is a production center, and a Tokyo Office in charge of the basic design of casks.

The Operation has approximately 220 employees, 95 of whom are assigned to nuclear-related departments.

3. Points of Review

Among the nuclear related activities carried out at the Operation, the review concentrated on activities related to nuclear safety carried out at the stages of design and manufacture, with the aim of demonstrating functions required from the perspective of nuclear safety (including related occupational safety) in the designed and manufactured machinery, equipment and systems.

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

May 20 (Tue.) to May 22 (Thu.), 2003

(2) Formation of Review Teams

A group: Tohoku Electric Power Co., Inc., Global Nuclear Fuel Japan, Ltd.

B group: Fuji Electric Co., Ltd., 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	
5/20 (Tue.)	A M	Opening (Greetings, Members Introduction, explanation of plant facilities, work summary, etc.)			
		1. Organization/ Administration	< President, HZD&E > [Interviews]	3. Design/ Manufacture	- Design management [Document Examination]
			- Effective organization and management [Document Examination]		- Manufacturing management [Document Examination]
	P M	1. Organization/ Administration	- Safety culture [Document Examination]	3. Design/ Manufacture	- Manufacturing Division [Field Observation]
		2. Education/ Training	- Training facilities etc [Field Observation]	4. Handling of important issues	- Nuclear safety - Incorporation of problems [Document Examination]
		2. Education/ Training	- Qualification certification - Planning and implementation [Document Examination]	3. Design/ Manufacture 4. Handling of important issues	< Manager class > < Responsible persons > [Interviews]
5/21 (Wed.)	A M	1. Organization/ Administration	< Manager class > [Interviews]	4. Handling of important issues	- Nuclear safety - Incorporation of problems [Document Examination]
		1. Organization/ Administration 2. Education/ Training	< Responsible persons > [Interviews]		
	P M	Verification of Facts		Verification of Facts	
5/22 (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 the Operation, 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 president of HZD&E, 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 the Operation 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
- (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 the Operation, we have not found any item in the nuclear safety field that would lead to a serious accident unless immediate remedies were taken.

It was confirmed that the Operation has introduced OHSAS18001 (Occupational Health and Safety Assessment Series) activities^v, TPM activities^{vi}, and ISO9001 (Quality Management System) activities as continuous activities across the entire Operation to enroot the sense of manufacturing casks that meet the quality required by customers in a safe and reasonable manner and that the employees are striving in unison to achieve it.

As to ISO9001 activities, it was confirmed that the quality policy of the president of HZD&E, “Gain customers’ confidence by aiming to improve product reliability and ensure safety” and “Work wholeheartedly and earnestly, observing the basics of the business” is understood and addressed by all levels of the team.

Concerning the issue of manipulating data of voluntary inspections and the like, the president of HZD&E himself delivered a message at the overall morning assembly of workers immediately after the revelation when he announced his instructions to build a corporate culture that would not conceal problems. It was also confirmed that the instructions were incorporated into the FY 2003 managerial policy and were thoroughly and continuously disseminated to the employees.

Regarding corporate ethics, it was confirmed that, after Hitz's "Corporate Philosophy, Managerial Attitude, and Codes of Conducts" was laid down in December 1990, "Keywords to Observing Corporate Ethics" (renamed to "Hitz Charter of Ethical Conduct" in April 2003) comprised of twelve clauses was laid down in September 1998, which was distributed to all employees in the form of cards and thoroughly disseminated through lectures, new employee education, and so forth. It was also confirmed that, in addition to the current work meetings between labor and management, a system is under study in which internal opinions are to be heard via electronic mail.

It is expected that the Operation will continue more voluntary efforts aiming to further improve safety culture, rather than being satisfied with the current status.

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.

Implementing active improvement activities via TPM activities

Aiming at "Zero Failures," "Zero Accidents," and "Zero Losses," extensive business improvements are being carried out via TPM activities by eight dedicated sections and redundant small circles, including those in charge of quality assurance and a safe, healthy environment. Examples of improvement that are the fruits of these activities have been organized into "One-point Lesson Sheets" and the like, which are put up on each circle's activity board, so that everyone can confirm the details of the improvements. In addition, good examples of improvement are published at example of improvement publication meetings, so that they can be disseminated horizontally to other circles, contributing to the improvement of quality and safety.

Improving morals by creating ideas to identify on-site problems

As part of the activities to "elicit problems" to improve morals, the person in charge makes a note of on-site problems on a daily basis and submits it to the group leader. Even if there are no problems, the person reports that there are "no problems." They make it a rule to enter in the note not only problems about on-site equipment, but even insignificant mistakes that would be incapable of leading to incompatibility, with the aim of improving morals to prevent problems from being concealed.

Secure confirmation of design documents with inspection-drawings check sheets

It has been worked out to ensure that checking can be done securely by using "inspection-drawings check sheets," in which 49 items to be checked are specified together

with the departments in charge of checking individual items, so that checking the collation with authorization documents and the like can be done efficiently when design documents are examined by relevant departments. Confirmed evidences (records that are colored when checked and confirmed) are also maintained. This method can be appreciated as an effective activity to improve the reliability of design documents.

Systematic activities to reduce the origins of risks using the OHSAS18001 method

To ensure labor safety, efforts are being made to maintain and improve labor safety by laying down fiscal year programs for individual departments using the Occupational Health and Safety Assessment Series (OHSAS) with regard to labor accident prevention, education, and risk prediction. Specifically, systematic activities are being carried out to reduce the origin of risks by identifying risk sources (work) in terms of occupational safety and health, and eliminating the causes of dangers (risks) by evaluating and registering risks and developing and implementing countermeasures.

Implementing multifaceted evaluation by the 4-M analysis of causes of incompatibility

In the event that incompatibility occurs in the process, an “incompatibility report” is issued pursuant to the regulations. However, the department in charge of the cause conducts multifaceted analysis from the viewpoint of "4-Ms" (Man, Machine, Material, and Method) to help study the exact cause and work out countermeasures. In particular, active analysis is conducted with respect to causes by Man. “4-M Analysis Sheets” are designed to help confirm five steps in due order from confirming 4-Ms to restraints after taking countermeasures.

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

Implementing ethics education every year for the entire Operation

Ethics education is implemented at the main office of Hitz when training is offered for new employees just out of university and managers. However, ethics education is not offered other than the training for new employees and managers. It is desirable to implement ethics education for the entire Operation.

Displaying a list of qualified personnel on-site.

In the manufacturing department, workers acquire qualifications that are required for the category of work that they are engaged in. Qualified workers make it a rule to attach appropriate seals on their helmets, so that the concerned parties can identify their

qualifications. It is desirable, however, to post a list of qualified personnel, so that even external personnel can identify them.

Displaying the “Emergency Liaison Chart” on-site

The emergency liaison chart in case of on-site accidents and problems is displayed in the on-site administration room. It is desirable, however, to post it on-site, so that it can be easily referred to for quick response.

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 spent fuel

ⁱⁱ **HZ-75T:** The model number of a type of transport container that contains cooling water (wet-type). As shielding materials, lead and ethylene glycol water are used against gamma rays and neutron rays, respectively.

ⁱⁱⁱ **Canister:** A canister typically means a tea canister, coffee can, cylindrical container, and so forth. It is a container that efficiently contains spent fuel assemblies in a cask.

^{iv} **ISO9001:** A standard established by the International Standards Organization that prescribes requirements for quality management systems. It is a standard that assures that the organization concerned has a quality management system making it capable of continuously supplying products and services that meet the customers' requirements, legal and public regulatory requirements, and that it is implemented appropriately.

^v **OHSAS18001 (Occupational Health and Safety Assessment Series) activities:** Occupational Health and Safety Assessment Series/OHSAS 18001 is a standard for occupational health and safety management systems, which has been developed for companies to efficiently fulfill the obligations required for safety and health.

^{vi} **TPM activities:** An abbreviation for Total Productive Maintenance activities, which aims to achieve zero losses through redundant small-group activities in which all personnel from top management to front-line employees across all departments, including production, development, sales, and administrative departments, by building a mechanism on-site and on-the-spot to prevent all kinds of losses, targeting "Zero Accidents, Zero Defects, and Zero Failures," covering the entire life cycle of the production system with the aim of establishing a corporate characteristic pursuing the ultimate efficiency (overall efficiency) of the production system (according to the Japan Institute of Plant Maintenance).