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<h2>Summary Report of Peer Review</h2>
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(Provisional Translation)

Place of Review:	Nuclear Development Corporation (Tokai-mura, Naka-gun, Ibaraki Prefecture)
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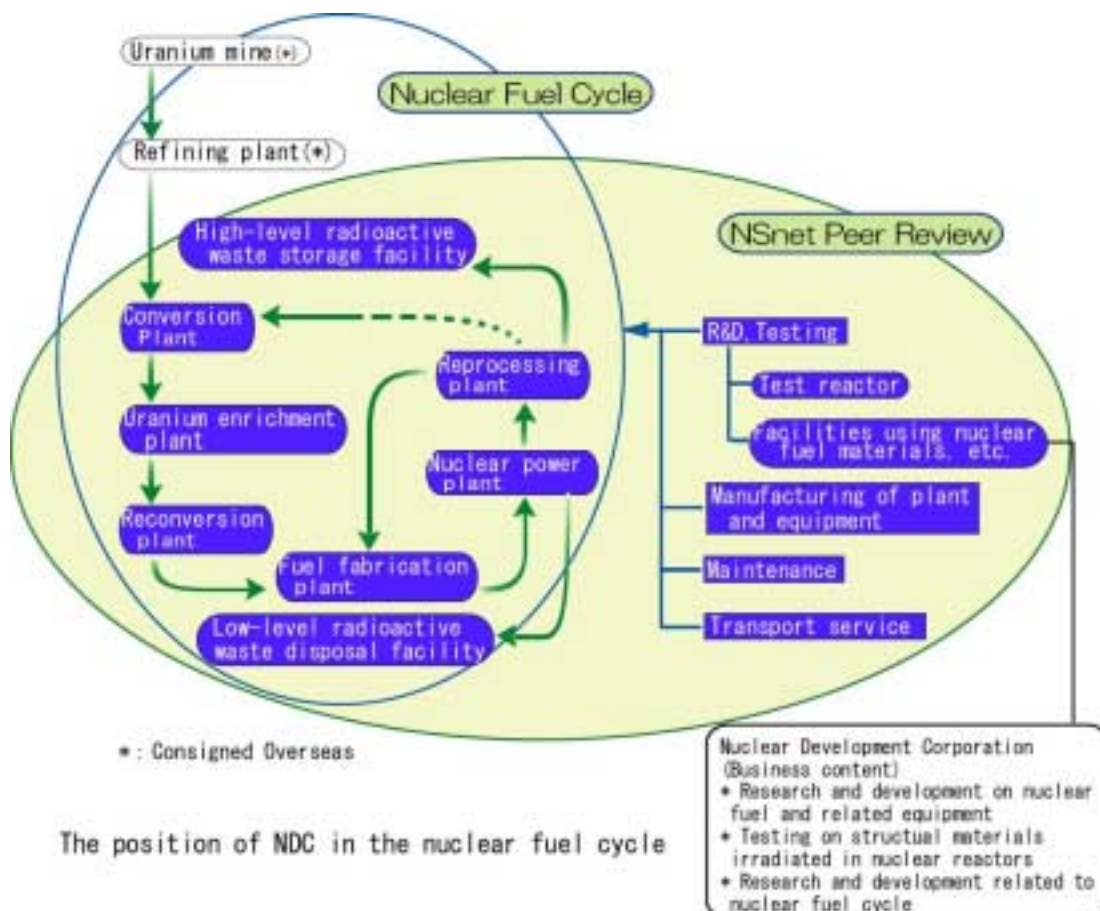
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1. Objectives

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

The target of this review was the Tokai area of the Nuclear Development Corporation in Tokai-mura, Naka-gun, Ibaraki Prefecture (hereafter referred to as NDC). As shown below, NDC is a company that conducts R&D and testing on nuclear fuel and structural materials irradiated in nuclear reactors, relating to the “nuclear fuel cycle.”



NDC was founded in April 1990, inheriting the businesses in the Tokai area from Mitsubishi Heavy Industries, Ltd. and Mitsubishi Atomic Power Industries, Inc. In April 1998, NDC consolidated the Nuclear Power Applied Technology Division of Mitsubishi Heavy Industries, Ltd. as its Omiya Research Division. Presently, there are about 120 employees in total (about 80 employees in the Tokai area and 40 employees in the Omiya Research Division), in addition to other members from collaborating companies (about 20 members in the Tokai area and 10 members in the Omiya Research Division).

In the Tokai area, there are Hot* Laboratory (Fuel) conducting destructive and non-destructive tests etc. on irradiated nuclear fuel, Hot Laboratory (Material) conducting tests related to the integrity of the materials irradiated in nuclear reactor primary systems, and Fuel Test Building conducting tests for nuclear fuel development. There are also two Storage Buildings for the radioactive solid wastes. In addition to these facilities, there are Uranium Test Facility and Laser Building. Although these facilities previously conducted basic research related to the enrichment technology of uranium, they are now no longer used since the operations were discontinued at the Company. As a cold** facility not handling radioactive substances, there is also a Structural Material Test Building conducting thermo-hydraulic tests pertaining to nuclear fuel assembly.

Among these facilities, Hot Laboratory (Fuel), Hot Laboratory (Material), Fuel Test Building, Storage Buildings, and Uranium Test Facility for the storage of nuclear fuel materials are targeted for this review. The Structural Material Test Building, used as a cold facility, and the Laser Building, which is not being used today, are out of the scope of this review.

As shown below, the following R&D activities, and tests are conducted on nuclear fuel and structural materials irradiated in nuclear reactors in the Tokai area.

(Principal Operations in the Tokai Area)

1) Research and development on nuclear fuel and related equipment

- Improvement in the reliability of light water reactor fuel and study of enhancing measures
- Development of high burn-up fuel; research and development of MOX fuel
- Development of fuel for the advanced reactors
- Development and improvement of the core internals surrounding the fuel

- * Qualitatively expressed, the word “hot” means a high level of radioactivity. “Hot Laboratory” is a testing room that can safely handle highly radioactive substances with work cells. The cells have adequate shields, and experiments are conducted by using manipulators from outside of the cell.
- ** Qualitatively expressed, the word “cold” means a weak level of radioactivity or no radioactivity at all.

2) Tests for structural materials irradiated in nuclear reactors

- Thorough examination of primary structural materials (structures inside the reactors, steam generators, etc.)
- Surveillance tests on reactor vessel materials (examination of changes in the mechanical characteristics by irradiating)
- Efficiency tests on the charcoal filters (verification tests on the capacity to eliminate radioactive iodine)

3) Research and development related to the nuclear fuel cycle

- Development of advanced technology for reprocessing

3. Points of Review

NDC does not constantly produce certain products, but operates various kinds of R&D activities and tests as mentioned above at the facilities including Hot Laboratory where radioactive material such as irradiated fuel may be handled.

This review targeting NDC focused on safety measures for new operations including ones involving changes in the equipment to comply with the Company’s characteristic R&D activities. It also stressed measures implemented to prevent serious accidents such as fires and criticality at the test facilities handling nuclear fuel materials.

The review was divided into six sections: 1) Organization/administration, 2) Emergency measures, 3) Education/training, 4) Operation/maintenance, 5) Radiation protection, and 6) Serious accident prevention. It was carried out as focusing on the best practices in the nuclear fuel cycle industry.

In the serious accident prevention field, the review was conducted from the perspective of preventing accidents such as electric power loss or faulty operations as

well as criticality accidents and fires or explosions.

In the other fields, as considering the factors behind the criticality accident at the JCO uranium processing plant last year (hereafter referred to as “the JCO accident”), while focusing on the safety measures for those operations including changes in equipment or new operations as mentioned above, the review focused on a number of issues relating to the factors including the policies and activities of the organization, the organization’s system and clarification of responsibility, worker education and training, worker knowledge and skills, the observation of written operation procedures, and the transfer of technical knowledge in an effort to cultivate and improve the “nuclear safety culture.” For the operating equipment and facilities, particularly adequate safety awareness and the ethics of employees’ actions, as well as the company’s self-checking activities that affect the safe operation of equipment and facilities, were considered as essential.

4. Period and Outline of Review

(1) Date

July 11 (Tue.) to July 14 (Fri.), 2000

(2) Formation of Review Teams

1st group: The Japan Atomic Power Co.; Laser Atomic Separation Engineering Research Association of Japan

2nd group: Sumitomo Metal Mining Co., Ltd.; NSnet Office

3rd group: The Chugoku Electric Power Co., Inc.; The Japan Nuclear Cycle Development Institute (JNC)

Coordinators: NSnet Office

(3) Fields of Responsibility

1st group: Organization/administration, emergency measures, education/training

2nd group: Operation/maintenance, radiation protection

3rd group: Serious accident prevention

5. Schedule of Review

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

		1 st Group	2 nd Group	3 rd Group
7/11 (Tue.)	AM	Opening (Introductory outline of company/facilities, etc.)		
		Document Examination (1. Organization/administration)	Document Examination (4. Operation/maintenance)	Plant Observation (Fuel Test Building)
	PM	Document Examination (1. Organization/administration)	Document Examination (4. Operation/maintenance)	Document Examination (6.1 criticality safety)
			Plant Observation (Uranium test plant)	
7/12 (Wed.)	AM	Plant Observation (Hot Lab (Fuel)) (Hot Lab (Material))	Document Examination (5. Radiation protection)	Plant Observation (Hot Lab (Fuel)) (Hot Lab (Material))
			Plant Observation (Fuel test building) (Hot Material Lab (Material)) (Storage Building)	
		Document Examination (2. Emergency measures)		
	PM	Document Examination (2. Emergency measures) (3. Education/training)	Plant Observation (Hot Lab (Fuel))	Document Examination (6.3 Accidents from faulty operations) (6.4 Accidents from elec. power loss)
		Plant Observation (Fuel Test Building)	Document Examination (5. Radiation protection)	Plant Observation (Storage Building)
7/13 (Thu.)	AM	Interview (Board of directors, managers) (Person in charge of research) (Person in charge of testing)	Document Examination (5. Radiation protection)	Document Examination (6.2 accidents from fires/explosions)
			Interview (Person in charge of research) (Person in charge of testing) (Managers)	
		Verification of Facts		Verification of Facts
	PM	Verification of Facts		
7/14 (Fri.)	AM	Verification of Facts, Closing		

6. Methods and Items of Review

6.1 Methods of Review

Targeting the various activities carried out to improve the safety promoted by NDC, this review pointed out some good practices and items-to-improve, through observing the plants where the activities take place, examining and studying the documents presented by NDC, and interviewing employees, as shown below.

Moreover, during the review, the review team attempted to enhance nuclear safety culture through introducing example activities such as “discussions for working environment improvement” occasionally.

(1) Plant activities observations

For the plant activities observation, direct observations of how actual activities are implemented for the items confirmed in the interviews and documents, were conducted with investigations based on the experiences 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 operation observation, documents related to the observation were required, and more detailed investigations were done.

(3) Interviews

Interviews based on the following objectives were conducted with the board of directors, managers, and persons in charge of research and testing.

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

6.2 Items of Review

The plant observations, 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

In this section, the review focused on the issue of ensuring nuclear safety, and examined whether the manpower required for safe operations was secured, whether

“safety culture” that always prioritizes safety, was fully recognized, and whether adequate studies were given to human-errors.

(Review Items)

(1) Effective Organization Management

- a. Clarifying the line-organization and system of responsibility
- b. Justifying the operation system
- c. Responsibility and management of the contracted employees (employees from affiliate companies)
- d. Setting up new goals of the organization
- e. The leadership of middle to upper managers

(2) Cultivating Safety Culture

- a. Creating a work environment where every person in the organization gives priority to safety

(3) Human Factor

- a. Further consideration of the human factor

Section 2: Emergency Measures

Considering the enforcement of the Nuclear Disaster Special Measures Law in June of this year (hereafter referred to as the “Nuclear Disaster Law”), the review examined whether the equipment and plans used in an emergency were prepared, and whether training had actually been carried out.

(Review Items)

(1) Emergency Plans

- a. Adoption of emergency plans
- b. Organizational preparedness for emergency
- c. Maintenance of emergency manuals
- d. Information dissemination to employees

(2) Facilities, Equipment, and Resources in Emergency

- a. Maintenance of facilities, equipment, and resources

(3) Emergency Training

- a. Execution of accident trainings

Section 3: Education/Training

Based on the idea that improvements in the level of safety awareness and skills of employees increased accident prevention, the review examined whether effective education and training systems had been maintained, whether systems of qualification etc. had been introduced, and whether those systems were actually being carried out.

(Review Items)

- (1) Qualifications
 - a. System of certificate qualifications
 - b. Evaluation criteria
- (2) Implementation of Trainings
 - a. Systems of education and trainings

Section 4: Operation/maintenance

The review in this section focused on various items related to the operations whether safety was highly guaranteed. Concerning personnel, it examined whether or not the various documents such as manuals and operational procedure books, etc. were prepared, whether or not employees fully understood them, and whether the handing down of technology at the company was properly carried out. Concerning the equipment, it also tested whether or not there was good management and a clear division of safety functions.

(Review Items)

- (1) Implementation of Operations/maintenance
 - a. Verification, procedures, and methods for safe operations
 - b. Verification, procedures, and methods of inspection for containment and preventing radiation problems
 - c. Verification, procedures, and methods for non-stationary work
- (2) Employee Skill and Knowledge
 - a. Knowledge about general safety
 - b. Knowledge about radiation safety
- (3) Manuals and Books Regarding Operations/maintenance
 - a. Preparation of books and manuals
 - b. Making books and manuals on operations, inspections, and methods of authorizations

- c. Consistency of authorized items
 - d. Revision of books and manuals
- (4) Operation of Facilities and Equipment
 - a. Clarification of safety functions
 - b. Equipment and facility interlock
 - c. Inspection of equipment and facilities
- (5) Work Experience
 - a. Past trouble instances and the countermeasure

Section 5: Radiation Protection

This section evaluates the strategies and conditions of implementation from the perspective of the administration of radioactive substances, prevention of leakage into the environment, and employee dose control.

(Review Items)

- (1) Administration of Radioactive Substances
 - a. Administration of radioactive fuel
 - b. Administration of radioactive waste
- (2) Containment of Radioactive Substances
 - a. Appropriate administration of negative pressure
- (3) Dose Control
 - a. Employee dose control
- (4) Observation of Radiation Dose
 - a. Regular observations
 - b. Emergency observations

Section 6: Serious Accident Prevention

In order to prevent accidents from having a big impact on the surrounding areas, this section examined whether the employees at the plant were aware of certain equipment capable of causing accidents. It also measured whether multiple measures were being taken to combat this problem, or whether there was a system that promptly detected problems when they occur.

(Review Items)

- (1) Criticality Safety

- a. Education offered to employees and employee knowledge concerning criticality safety
 - b. Procedures, equipment, and instruments which require the administration of criticality safety
 - c. Methods of criticality safety administration
- (2) Accidents Caused by Fires/Explosions
- a. Procedures, equipment, and instruments that can cause fires/explosions
 - b. Administrative methods for the prevention of fires/explosions
 - c. Detection of fires/explosions at the time of an accident and methods of alleviating the problem
- (3) Accidents Caused by Faulty Operations
- a. Procedures, equipment, and instruments that might cause accidents by faulty operations
 - b. Administrative methods for the prevention of accidents by faulty operations
 - c. Detection and alleviation of accidents caused by faulty operations
- (4) Accidents Caused by Loss of Electric Power
- a. Procedures, equipment, and instruments that largely influence loss of power
 - b. Administrative methods for the prevention of power loss

7. Main Conclusions

Taking a broad view of this review conducted at NDC, with respect to nuclear safety, no problems were found that would lead to the occurrence of a serious accident, even if the improvement measures were not adopted immediately. It was confirmed that the employees of this company and those from other collaborating companies are united as one and are conscientiously working toward continuing and strengthening the assurance of safety in the nuclear industry. In particular, we confirmed that sufficient deliberation and measures to ensure safety are conducted, including the use of the Inspection Meeting on Risk Foresight (activities that predict danger) which thoroughly addresses such issues as safety and testing methods each time new tests are conducted in the company's special hot laboratories, facilities, etc. In the future, it is desirable that the company continues to make further self-maintaining efforts aiming at fostering a better "safety culture."

At this peer review, a number of good examples were discovered that should be introduced to the other NSnet members and the nuclear fuel cycle industry. The main

examples are listed below.

- First of all, the company is trying to make employees thoroughly aware of safety, such as publicizing NDC Corporate Policies and NDC Guidelines on Staff Action, implementing the content of ethics lectures given by the president, and intensifying the system of auditing by self and outside members of the company.
- The company has established a system that fully discusses and examines safety in advance before conducting new testing with equipment or machinery newly installed or modified. The safety issues are examined by wide classed members in organizations for discussion and study called the Inspection Meeting on Risk Foresight, the Safety Assessment Meeting, and the Safety Inspection Meeting, which is held when necessary. Presently, the system is effectively working to ensure safety.
- The quantity and location of nuclear fuel that is stored or used in the Hot Laboratory (Fuel), including nuclear fuel provided for post-irradiation examinations, are strictly controlled and collectively stored with a sample control system. Moreover, the control of the samples is properly conducted by using a digital camera to ensure their details and location are known, even when the samples have been extensively subdivided during an examination of the integrity of the nuclear reactor structural materials.

On the other hand, in order to continue the good performance to date and further improve the present safety work level of NDC, some proposals are given, the main ones of which are listed below.

- Concerning the administration of nuclear power safety, in addition to the present activities, it is hoped that the company will aim at fostering more “safety culture” and continue to further independent presentation efforts without allowing the lessons of the JCO accident to wear thin with time. For example, as some items to be discussed in the Corporate Health & Safety Committee, it is desirable to specify the important items related to nuclear safety that are in line with the actual situation.
- While continuing to point out the possibilities of future human error occurrence, further examinations to achieve a reduction of human error will be conducted through such things as displays arousing attention to indicator panel and switches of measuring instruments, installation of equipment covers, etc.
- For the education of criticality safety, it is desirable to specify the frequency of

implementation of the trainings in the company regulations. It is also desirable to hand down know-how to younger workers by clarifying, in the company regulations and education textbooks, etc., the reasons and concepts for setting limits on the amounts of fission products to be handled to achieve criticality safety.

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