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Summary Report of Peer Review

(Provisional Translation)

Place of Review:	**Enrichment and Disposal Office, JAPAN NUCLEAR FUEL LIMITED. (Rokkasho-mura, Kamikita-gun, Aomori)**
Date of Review:	**May 22-25, 2001**
Publisher :	**Nuclear Safety Network**

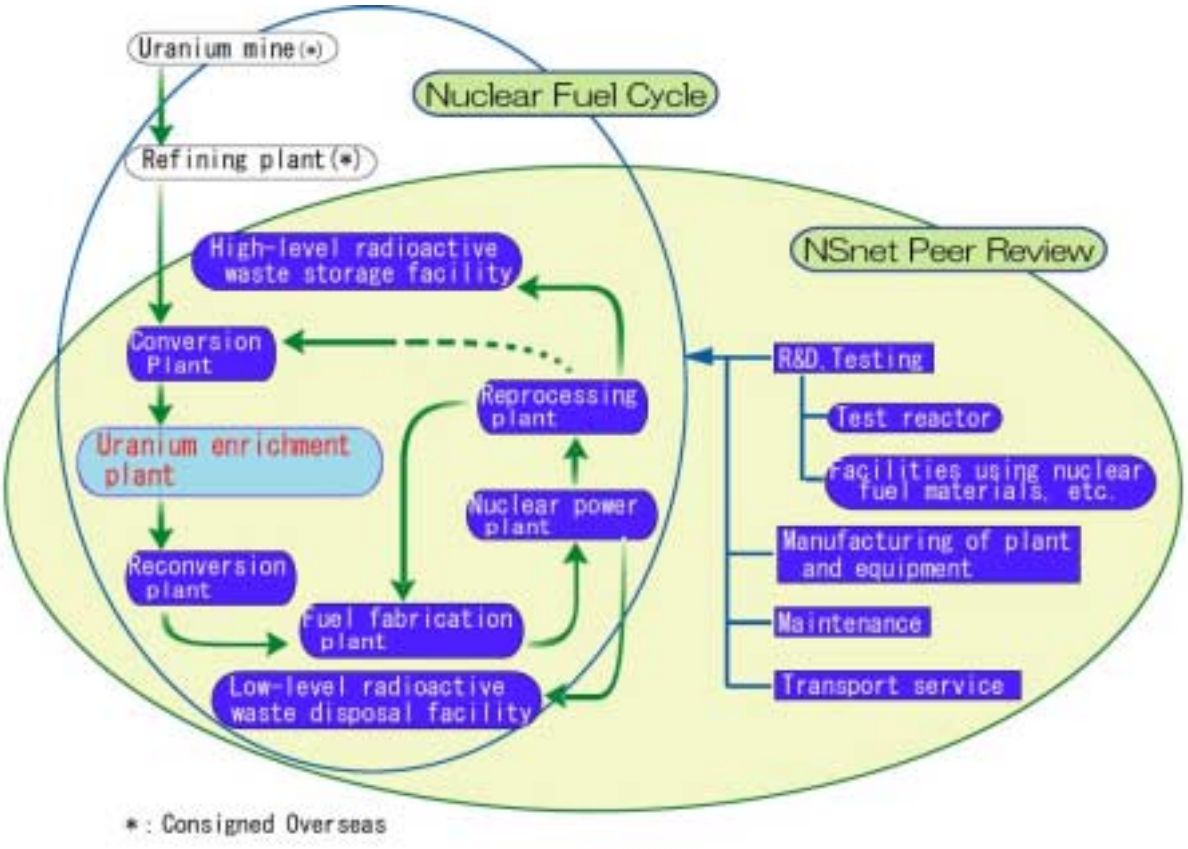
Contents

1. Objectives

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

2. Summary of Facility Operations

Japan Nuclear Fuel Limited (JNFL) operates three facilities in Rokkasho-mura, Kamikita-gun, Aomori Prefecture: Uranium Enrichment Plant, Low-level Radioactive Waste Disposal Center, and High-level Radioactive Waste Storage Center. In addition, JNFL is engaging in the construction of a Reprocessing Plant (facility to accept and store spent fuel is in operation) and the commercialization of "MOX Fuel[1] Fabrication Business." (JNFL Homepage: http://www.jnfl.co.jp/index-e.html)



The position of the uranium enrichment plant in the nuclear fuel cycle

The Enrichment and Disposal Works (hereafter referred to as "the Works"), which were subject to the review, has a site area of approximately 3.6 million square meters,

[1] MOX Fuel: Mixed-Oxide fuel: Nuclear fuel that contains fissile nuclides composed of two or more types of oxides. Generally, it refers to nuclear fuel mainly composed of uranium oxide and plutonium oxide (excerpted from "Nuclear Dictionary: The Nikkan Kogyo Shimbun Ltd.")

located on the Pacific Ocean side of the Shimokita Peninsula, facing Obuchi Numa (a swamp), approximately 70 km northeast of Aomori-city. The Works consist of three facilities: Uranium Enrichment Plant, Low-level Radioactive Waste Disposal Center, and Uranium Enrichment Research & Development Center. In view of the nuclear criticality accident that occurred at the conversion test building of JCO on September 30, 1999 (hereafter referred to as the "JCO Accident"), the review was conducted focusing on the Uranium Enrichment Plant (hereafter referred to as "the Plant") at which UF_6[2] is also handled.

The Plant applies the centrifugal separation method, which is a genuine domestic technology developed by Power Reactor and Nuclear Fuel Development Corporation (PNC) (currently, the Japan Nuclear Cycle Development Institute). It also has two uranium enrichment production lines, called "RE-1" and "RE-2".

RE-1 consist of four operation units, each of which has a capacity of 150tSWU[3]/year, with a total RE-1 capacity of 600tSWU/year. RE-2 consist of three operation units, each of which has a capacity of 150tSWU/year with a total RE-2 capacity of 450tSWU/year. The total capacity of the Plant is 1,050tSWU/year. RE-1A, which started operating in March 1992, was subjected to planned shutdown in April 2000 because the number of centrifuges have been stoppage, which significantly affected the operation to gain the designated degree of enrichment.

Production Line	Operation Unit (150tSWU/year)	Start of Operation	Operation Status
RE-1 (600tSWU/year)	RE-1A	March 1992	Planned shutdown
	RE-1B	December 1992	Operational
	RE-1D	May 1993	Operational
	RE-1C	September 1994	Operational
RE-2 (450tSWU/year)	RE-2A	October 1997	Operational
	RE-2B	April 1998	Operational
	RE-2C	October 1998	Operational
Total	1,050tSWU/year	-	-

The number of employees who are directly involved with the Plant is approximately 150 including the Director of the Works (hereafter referred to as "the Director"). Approximately 60 of these employees directly belong to the Operation Division and are on duty in 6 groups on 3 shifts. Among the other employees,

[2] Uranium hexafluoride (UF_6): Solid clear crystal at a normal temperature. Since it sublimes and turns into gas at 56.6 degrees Celsius, it is used to separate uranium isotopes. Its triple point is 64.01 degrees Celsius. At 64.05 degrees Celsius or higher, liquid phases occur, which eventually turn into two phases (gas and liquid) and can be handled as liquid (excerpted from "Nuclear Dictionary: The Nikkan Kogyo Shimbun Ltd.")

[3] tSWU: An abbreviation for Separative Work Unit. It is an important concept that is used as a measure to indicate the amplitude of the value raised by enriching uranium. Kilograms and tons are used as actual units, which is confusing because the same units are used to indicate the volume of uranium. To avoid such confusion, SWU is added as in tSWU. Fuel necessary to operate one unit of a 1 million kW nuclear power station for one year is equivalent to 120 tSWU (excerpted from "Nuclear Dictionary: The Nikkan Kogyo Shimbun Ltd.")

approximately 20 belong to the Maintenance Division, 50 to the Technical Support Divisions (Quality Assurance, Enrichment Technology, Electric and Mechanical, and Radiation Control Divisions), and 20 to the Administration Department (General Affairs, Personnel, and Safety and Health Divisions). The Radiation Control Division concurrently serves to the Disposal Center as well. The Administration Department also concurrently works as the Reprocessing Plant Works. In addition, approximately 530 employees of cooperating companies are stationed at the Works to support plant operation and maintenance.

3. Points of Review

Since the NSnet was established because of the JCO Accident and the Plant is a nuclear fuel facility that comes under the designation as fuel fabrication facilities as defined in the Law Concerning the Regulation of Nuclear Source Materials, Nuclear Fuel Materials, and Reactors (hereafter referred to as "the Nuclear Reactor Control Law"), the review of the Plant focused on the "prevention of serious accidents, such as criticality accidents," in the same way as other reviews have been conducted at operations with nuclear fuel facilities, including fuel fabrication facilities. In the review, in view of the recent trends in nuclear safety and accident prevention, we focused on the five basic viewpoints as described below in terms of both technical and social safety.

(1) Foundation to ensure nuclear safety (including communication with cooperating companies)
(2) Relationship with the community (improving anti-disaster measures)
(3) Incorporating operating experience into the improvement of safety
(4) Reflecting and addressing lessons from the JCO accident
(5) Action on the Recent issues

Review items were decided and compared with the best practices in the nuclear industry by classifying individual elements of the above-mentioned five viewpoints into the following six areas: ① organization/administration, ② emergency measures, ③ education/training, ④ operation/maintenance, ⑤ radiation protection, and ⑥ serious accident prevention.

As for "(1) Foundation to ensure safety (including communication with the cooperating companies)," safety culture should be fostered to establish an effective organization. Sufficient education and training should be provided to operators and maintenance personnel (employees of the Maintenance Division). Effective operation and maintenance administration should be achieved by provision and observance of the documents/manuals. Appropriate communication with cooperating companies should be maintained. Radioactive waste treatments and radiation protection should be conducted appropriately.

"(2) Relationship with the community (improving anti-disaster measures):" Emergency measures should be implemented appropriately. Efforts should be made to coexist with the community and promote the safety of nuclear activities through information disclosure and public acceptance activities.

"(3) Incorporating operating experience into the improvement of safety:" Problems that occurred at nuclear facilities in the past should be incorporated into the Plant in

an appropriate manner to facilitate the improvement of equipment and operating methods.

"(4) Reflecting and addressing lessons from the JCO accident:" Criticality safety control[4] at cascades and waste water treatment process[5], and so on should be thoroughly ensured. Criticality safety education should be implemented. Activities should be promoted to foster and improve nuclear safety culture in view of the factors that caused accidents.

"(5) Recent Issue:" Quality control should be enhanced to prevent the problem of data manipulation in inspections of piping welds, spent fuel transportation casks, and MOX fuel in addition to human error prevention.

4. Performing of the Review

① Date

May 22 (Tuesday) to May 25 (Friday), 2001

② Formation of Review Teams

1st group : Japan Atomic Energy Research Institute; Mitsubishi Heavy Industries, Ltd.

2nd group : Nuclear Fuel Industries, Ltd.; Chubu Electric Power Company, Inc.

3rd group : JGC Corporation; NSnet Office

Coordinators : NSnet Office

③ Fields of Responsibility

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

2nd group : Operation/maintenance

3rd group : Radiation protection, Serious Accident Prevention

[4] Criticality safety control: To safely control facilities, such as nuclear fuel processing plants and spent fuel reprocessing plants which handle fissile substances in a way so that such fissile substances do not reach a criticality state, causing criticality accidents (excerpted from "Nuclear Dictionary: The Nikkan Kogyo Shimbun Ltd.")

[5] Waste water treatment process: A process that applies various treatments, such as condensation, precipitation, and filtration to waste water generated in radiation-controlled areas.

5. Review Schedule

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

<table>
<tr><th></th><th></th><th>1st Group</th><th>2nd Group</th><th>3rd Group</th></tr>
<tr><td rowspan="8">May 22 (Tue.)</td><td rowspan="2">AM</td><td colspan="3">Opening (Introductory outline of company/facilities, etc.)</td></tr>
<tr><td colspan="3">Plant Tour [Central control room, etc.]</td></tr>
<tr><td>AM</td><td>Document examination
1. Organization/ administration</td><td>Document examination
4.1 Effective operation administration</td><td>Document examination
5. Radiation protection</td></tr>
<tr><td rowspan="3">PM</td><td colspan="3">A reviewer introduced useful examples in the fuel fabrication plant (Presented by NFI)</td></tr>
<tr><td rowspan="2">Document examination
1. Organization/ administration</td><td>Document examination
4.1 Effective operation administration</td><td>Document examination
5. Radiation protection</td></tr>
<tr><td>Interview
[Managers]
[Operating personnel]</td><td>Field observation
[Waste storage building, etc.]</td></tr>
<tr><td rowspan="4">May 23 (Wed.)</td><td rowspan="2">AM</td><td rowspan="2">Document examination
2. Emergency measures</td><td rowspan="2">Document examination
4.2 Effective maintenance administration</td><td>Document examination
6.1 Criticality safety</td></tr>
<tr><td>Interview
[Responsible personnel]</td></tr>
<tr><td rowspan="2">PM</td><td>Field observation
[Emergency Operation Room]</td><td>Interview
[Managers]
[Maintenance personnel]</td><td rowspan="2">Document examination
6.2 Prevention of fires and explosions</td></tr>
<tr><td>Interview
[General manager]
[Managers]
[Responsible personnel]</td><td rowspan="2">Field observation
[Central control room, UF6 Feed and Withdrawal room, Waste Water treatment room, etc.]</td></tr>
<tr><td rowspan="3">May 24 (Thu.)</td><td rowspan="2">AM</td><td>Document examination
3. Education/training</td><td>Document examination
4.3 Control of nuclear,
4.4 Human error prevention activities
4.5 Reflection of past trouble instances</td><td>Document examination
6.3 Prevention of UF_6 leakage accidents</td></tr>
<tr><td colspan="2">Field observation
[Operation Training Room]</td><td rowspan="2">Field observation
[Central control room, UF6 Feed and Withdrawal room, etc.]]</td></tr>
<tr><td>PM</td><td>Conformation of the Review Results</td><td>Conformation of the Review Results</td><td>Conformation of the Review Results</td></tr>
<tr><td>May 25 (Fri.)</td><td>AM</td><td colspan="3">Conformation of the Review Results, Closing</td></tr>
</table>

6. Procedures and Items of Review

6.1 Review Procedures

The review was conducted with respect to various activities to improve plant safety as outlined below. Good practices and suggestions for improvement were identified through field observations of such activities, examination of the documents presented by the plant, and interviews with the employees.

During the review, the review teams also introduced useful examples of activities, such as efforts used to ensure labor safety by the companies and organizations to which the reviewers belong. This facilitated nuclear cultural exchange.

(1) Field Observations

Direct observation was made of actual activities to check whether they corresponded to items listed in documents and interviews. Findings were compared with reviewers' knowledge and experience.

(2) Document Examination

With regard to each review item, documents were examined while receiving explanation on them and requesting relevant documents as the need arose. In-depth examination was conducted, asking for relevant documents after observing field facilities and activities.

(3) Interviews

Interviews were conducted with directors, managers, operators, and maintenance personnel with the following objectives:

a. Understanding the attitude and awareness toward nuclear safety
b. Collecting additional information that could not be confirmed through documents
c. Questions and answers on problems identified during document examination
d. Grasping the degree of understanding of determined items and responsibilities imposed on each individual
e. Understanding the compliance status of determined items and whether such items have not been ruined.

6.2 Items of Review

Based on the following review items identified and developed in "3. Points of Review," field observations, document confirmation, and interviews were conducted, and the results were summarized into "**7. Major Conclusions**."

Section 1: Organization/Administration

To ensure nuclear safety, the review was conducted to check whether the necessary personnel were assigned to ensure safe operation, whether safety culture that always prioritizes safety was fully recognized, whether effective communication with cooperating companies was maintained, and whether public acceptance activities for the local community were promoted through the information disclosure.

The issue of data manipulation was examined in terms of quality control

enhancement and morality improvement.

(Review Items)

(1) Effective organization management
   a. Clarifying the line-organization and the organization responsibility
   b. Ensuring optimal personnel
   c. Setting up goals of the organization
   d. Leadership of the managers

(2) Activities to promote safety culture and improve morality
   a. Specific activities to promote safety culture
   b. Specific activities to promote morality
   c. Public acceptance activities for the local community

(3) Quality control
   a. Effective audit system
   b. Preventing data manipulation

c. Actions regarding the revised Law on Reactor Regulation and the revised Safety Rules.

Section 2: Emergency Measures

Emergencies here means the events described in the Special Law of Emergency Preparedness for Nuclear Disaster (hereafter referred to as the "Nuclear Disaster Law") and other events defined as emergency and abnormal in the Safety Rules. In the review, we focused on activities based on the Nuclear Anti-Disaster Law and Safety Rules.

(Review Items)

(1) Emergency plans
   a. Drawing up emergency plans
   b. Establishment of emergency organizations (including notification and liaison systems)
   c. Establishment of emergency procedures
   d. Education of emergency procedures to the employees and well known

(2) Emergency equipment, tools and resources
   a. Inspection and maintenance of equipment, tools, and resources

(3) Emergency training
   a. Implementation of training (results)

Section 3: Education/Training

Based on the idea that improving technical skills and safety awareness among employees contributes to improving nuclear safety, the review was conducted to examine whether effective education and training systems, including the systems of cooperating companies, have been established, whether credential certification systems have been introduced, and whether they have been implemented responsibly.

How the accumulation and transfer of technical know-how is incorporated in the education and training system was also included in the review items.

(Review Items)

(1) Qualifications

Qualifications here means the ones in connection with the operation and maintenance of enrichment plants

   a. System of certificate qualifications and evaluation criteria

(2) Training plans and implementation
   a. Education and training plans
   b. Implementation of education and training plans
   c. Technical transfer (know-how)

Section 4: Operation/Maintenance

We examined various items concerning operation and maintenance management to investigate from point view of a high level of safety is ensured. We also examined the Operation and Maintenance Departments, including cooperating companies, to clarify the appropriateness of personnel and organizations as well as the establishment and compliance with documents and manuals as common items. In addition, nuclear material accountancy, human error prevention activities, and how problematic instances that occurred at the Plant in the past have been reflected were reviewed.

(Review Items)
(1) Effective operation administration
   a. Operation organization
   b. Documents and procedures regarding to the operation, and compliance with them
   c. Design management
(2) Effective maintenance administration
   a. Maintenance organization
   b. Maintenance documents and procedures, and compliance with them
   c. Maintenance equipment and tools
   d. Work plans and administration
(3) Accountancy of nuclear materials (natural uranium, enriched uranium, depleted uranium[6])
(4) Human error prevention activities
(5) Reflection of past trouble instances

Section 5: Radiation Protection

We examined various measures and implementation status to investigate the appropriateness of radiation dose control for workers, confinement of radioactive substances, radioactive waste management.

(Items of Review)
(1) Employee dose control
(2) Confinement of radioactive substances
(3) Radioactive waste management

[6] Natural uranium, enriched uranium, and depleted uranium: Uranium that has the same composition of isotopes as naturally produced uranium (containing approximately 0.71 weight percent of ^{235}U) is called natural uranium. If the composition of ^{235}U exceeds that of natural uranium, it is called enriched uranium. If it is below that of natural uranium, it is called depleted uranium (excerpted from "Nuclear Dictionary: The Nikkan Kogyo Shimbun Ltd.") At the Plant, enriched uranium is controlled below 5 weight percent.

Section 6: Serious accident prevention

In view of the past accidents that have occurred at domestic nuclear fuel facilities, we examined criticality safety and measures against fires and explosions. Since UF_6 is handled at the Plant, UF_6 gas leakage prevention was included in the review items as applicable to re-conversion facilities.

(Items of Review)

(1) Criticality safety
   a. Criticality safety education and employees' knowledge
   b. Processes, systems, and equipment subjected to criticality safety control
   c. Criticality safety control methods

(2) Prevention of fires and explosions
   a. Processes, systems, and equipment for which fires and explosions are likely to occur
   b. Control methods for preventing fires and explosions
   c. Detection and mitigation of fires and explosions

(3) Prevention of UF_6 leakage accidents
   a. Processes, systems, and equipment for handling UF_6
   b. Control methods for preventing UF_6 leakage
   c. Detection and mitigation of UF_6 leakage

6.3 Good Practices and Suggestions for Improvement

(1) Good Practices

Good practices is identified the following view points:

"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

Suggestions for improvement is identified the following view points:

"After comparing the station's practices with the best in the nuclear industry, suggestions to improve and enhance safety activities should be recommended for further improvement 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, there is still room for improvement.

7. Major Conclusions

Summarizing the results from the review of JNFL's enrichment and disposal plants, no problems were identified as being of a type that may cause a severe accident unless nuclear safety improvement measures were be taken immediately. In addition, it was confirmed that all the employees, including General Manager and employees of cooperating companies, are seriously endeavoring to continue and enhance nuclear safety in a unified manner, although personnel loaned or transferred from electric power companies and the Japan Nuclear Cycle Development Institute, and manufacturers account for some 20% of all employees directly involved with the Plant, while proper employees account for 80%. In particular, it was observed that they conduct research into safety activities in other industries to promote specific and effective nuclear safety activities.

At the Plant, RE-1 has never been subjected any unplanned shutdown since its operation started in 1992, except for a partial shutdown in September 1995. RE-2 has a favorable operating record, without having any unplanned shutdown since the start of operation in 1997. It was also confirmed that the Plant emphasizes the importance of accumulating "safe and stable operation of a uranium enrichment plant" with the strong managerial policy and belief of "Safety equals quality," as represented by obtaining an ISO9002:1994 certificate for its quality assurance system based on the quality policy for safe and stable operation.

It is expected that the Plant will continue its safety activities, aiming to further improve its safety culture, rather than being satisfied with the current status.

It is also expected that the fruitful results from the review will be incorporated in other facilities of JNFL and among cooperating companies. These facilities include the Low-level Radioactive Waste Disposal Center and the High-level Radioactive Waste Storage Center, both of which are in operation, and the Reprocessing Plant, which is under construction.

The following major good practices were identified during the review, which should be introduced extensively to other members of the NSnet and the nuclear industry:

- Drawing up the Codes of Conduct to be observed by corporate personnel and diffusing them among the plant personnel

In December 1998, the "JNFL Charter" was drawn up, describing nine items of the Codes of Conduct to be observed by corporate personnel in simple, easy-to-understand sentences together with key words, including "Thoroughly ensuring safety and environmental preservation," "Establishing mutual trust with the community and social contributions," and "Establishing corporate and employee morals." Efforts are being made to have the contents of this "Charter of Conduct" well understood and diffused by distributing it to all employees and having it read aloud at gatherings and morning meetings among directors and employees.

- Quality management system based on the quality policy emphasizing safe and stable operation

At the plant, all work is performed prioritizing safety and environmental preservation pursuant in accordance with "Charter of Conduct." Specifically, the quality policy emphasizes safe and stable operation to unify quality with safety, so

that the quality management system that drives the PDCA cycle will work effectively.

- Using personal computers to call personnel in emergencies and to establish a liaison system

As a means of calling personnel to cope with emergencies at night and on holidays, a calling system using a personal computer has been installed, which is capable of making simultaneous calls to all subject personnel and confirming their availability. In addition, the Plant is actively engaging in the establishment of a comprehensive system using the above-mentioned personal computer system, incorporating liaisons with related external organizations that are currently conducted by sending simultaneous fax messages or using exclusive phone lines. This system is expected to become a model system in the nuclear industry when completed.

- Systematically prepared criticality safety control methods and their reliable operation

Appropriate criticality safety control methods are employed according to the property and volume of substances that are handled at the Plant. These methods have been prepared systematically. The interlocks[7] that have been employed and their control methods have been clarified. The control methods have been described in operating procedures and manuals to ensure reliable operation. Although the Plant delegates a lot of work to cooperating companies, proper hold points[8] are established in work processes to allow employees of the Plant to confirm compliance concerning criticality safety.

On the other hand, the following recommendations were made to further improve the activities to ensure safety at the Plant:

- Promoting communication with employees of cooperating companies

The Plant has been endeavoring to ensure smooth communication with cooperating companies through opinion exchange at meetings held by, for example, the Safety Promotion Council. To further promote these efforts, it is desirable to consider establishing a scheme that incorporates opinions from cooperating companies into task management. For example, by referring to activities, such as “periodic review meetings” that have been put into practice at some nuclear power stations and expanding discussion activities that are carried out among different levels of employees of the Plant to include cooperating companies.

- Integrating information for technology transfer and utilizing such information for education targeting younger employees

Know-how that has been acquired through approximately ten years of operation and maintenance experience at the Plant has been accumulated at each section. It is desirable to integrate such know-how systematically and consider utilizing such

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[7] Interlock: A mechanical or electrical device that allows certain functions to be activated when certain conditions are met. Various “interlocks” used at the Plant mean devices that “activate prescribed safety protection functions when operating status deviates from certain conditions.

[8] Hold point: A point at which it is confirmed whether or not proper work is performed while temporarily discontinuing a work series.

know-how, together with information concerning technical support based on agreements with the Japan Nuclear Cycle Development Institute, in particular, for the purpose of educating younger employees with the aim of technology transfer.

- Integrating and simplifying documents

Although procedures, bylaws, manuals, and guidebooks regarding the operation and maintenance of the plant have been well developed, it was confirmed that substantial efforts have been made to ensure consistency among different documents as well as to thoroughly inform and distribute revised versions to the persons concerned. It is desirable that documents be integrated and simplified to the extent that they do not affect work safety, even though they are necessary and essential.

Itemized reports are published on the Japanese homepage.