

Overview

1. Introduction

This report summarizes the results of the peer review (hereafter referred to as "review") conducted at Nuclear Development Corporation (NDC). In the Reviews conducted by Japan Nuclear Technology Institute (JANTI), review teams consisting of experts from both the member organization and JANTI visit the member facilities to conduct a specialized technical review regarding the theme of nuclear safety. The purpose of the review is to promote safety culture in the whole nuclear power industry by identifying good practices from which other members can learn and areas for improvement of the facility.

2. Overview of the Facility Reviewed

2.1 Company history

NDC was established in April 1990 through a succession of the operations of both Tokai Experiment Station, Takasago Research Institute of Mitsubishi Heavy Industries, Ltd. and Tokai Research Institute of Mitsubishi Atomic Power Industries, Inc., which merged with Mitsubishi Heavy Industries, Ltd. in 1995. In April 1998, all of the operations of Nuclear Power Applied Technology Department (reactor chemistry, radiation measurement, etc.) of the Mitsubishi Heavy Industries, Ltd. including reactor chemistry and radiation were transferred to NDC where they continue to be up to the present. NDC is located in Tokai-mura, Naka-gun, Ibaraki Prefecture and has approximately 80 employees.

2.2 Business profile

NDC specializes in nuclear power research and development. It conducts research and development as well as verification testing and evaluation for safety and reliability with regard to nuclear fuel, nuclear reactor materials, reactor chemistry, radiation measurement and so on.

The research and development of nuclear fuel includes the improvement, development and research on fuel pellets, fuel clad as well as the development and testing of fuel assemblies. Post-irradiation testing of spent fuel at nuclear

power plants is also conducted in hot cells.

In the research and development concerning reactor components and other related materials, test pieces placed inside the reactor beforehand (surveillance test pieces) are examined in hot cells to confirm the integrity of the materials. In addition, NDC conducts performance tests of charcoal filters used in power station HVAC systems to confirm the containment function of power plants.

In research and development related to reactor chemistry and radiation, the company undertakes improvements in PWR primary system water quality control technology, development of technology to reduce radiation exposure at power plants, development of technology for measuring radioactivity of radioactive waste, radiation behavior analysis and design of shielding, and so forth.

The obtained results have been applied to nuclear fuel, PWR plants, reprocessing facilities, waste disposal facilities and so on.

3. Review viewpoints

This is third peer review for NDC including the reviews by JANTI's predecessor, Nuclear Safety Network, in July 2000 and March 2005. In this review, the review team mainly focused on those which have been altered after the previous review as well as the company's current activities.

NDC exclusively engaged in nuclear power research and development and has obtained a license to use nuclear fuel material and radioactive isotopes. It has also enacted the Safety Regulations for Fuel Hot Laboratories and Nuclear Fuel Material Use Facilities. Since 2004, quality assurance program has been included in the scope of the Safety Regulations and the Safety Quality Assurance Plan has been enacted as a subordinate regulation, on which the Company has been carrying out its safety activities.

The NDC Company Policy, which gives the basic managerial philosophy of NDC, expressly states: "Ensure the nuclear safety first and contribute to the development of nuclear industry". In addition, it cites: "challenge high goals," "develop new technology and enhance research capabilities," "communicate actively with entities

outside the company," "achieve a liberal and open-minded workplace," etc. Also, standards of the NDC Employee behavior consists of six statements, including "put the nuclear safety first before everything else," "perform duties with integrity," and "endeavor to vitalize the workplace, to improve and refine operations, and to develop new technology."

Based on the situations above, following points were focused in the review:

- Specific activities to cultivate a safety culture
- Dissemination of senior management policy into research, development and testing works
- Communication between the Testing and Research Departments
- Performance of testing
- Handling of minor nonconformance
- Approach to the reduction of radiation exposure
- Conditions of the workplace
- Planning and training for emergencies

Specifically, the review was conducted in four functional areas: organization and administration, training, work management and maintenance, and radiation protection. In addition, following four items were reviewed as key issues: critical safety, UF₆ leak events, nonconformance management and human error prevention, and risk management.

4. Conducting the Review

(1) Review dates

October 22 (Wed) to October 24 (Fri), 2008

(2) Review team composition

Team leader: from NS Network Division, JANTI

Team members: team leader and five others

(One from Hitachi Zosen Mechanical Corporation, one from Kobe Steel,

Ltd. three from NS Network Division JANTI, and one from JANTI as a technical advisor)

(3) Allocation of Review group assignments

Group A: organization and administration, key issues

Group B: training, work management and maintenance, radiation protection

5. Review schedule

The review was carried out over a period of three days, with the schedule for each of the groups as shown below.

		Group A (Organization and administration, key issues)			Group B (Training, work management and maintenance, radiation protection)		
Oct. 22 (Wed)	AM	Review team meeting					
		Opening (greeting, member introduction)					
		Interview with the President					
		oKey issues	Management	Interview	oTraining oRadiation protection	Senior staff, etc.	Interview
	PM	Event observation		Event observation	oTraining oWork management and maintenance oRadiation protection	Management, etc.	Interview
		oOrganization and administration oKey issues	Management, Personnel responsible	Interview	On-site observation		On-site observation
		Review team meeting					
Debriefing with host (Confirm review results, confirm schedule for 2nd day)							
Oct. 23 (Thu)	AM	Observation of morning greeting, etc.		On-site observation	Observation of meetings, etc.	On-site observation	
		oOrganization and administration oKey issues	Management, Personnel responsible	Interview	oTraining oWork management and maintenance	Management, Personnel responsible Interview	
	PM	Event observation		walk-down observation	oTraining oWork management and maintenance	Personnel responsible, etc. Interview	
		oOrganization and administration oKey issues	Senior Staff responsible	Interview			
	Review team meeting						
	Debriefing with host (Confirm review results, confirm schedule for 3rd day)						
Oct. 24 (Fri)	AM	Review team meeting					
		[Confirm findings] Make final adjustments with host					
		Closing preparations					

	PM	Closing (explanation of results)
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6. Review Method and Report of Review Results

6.1 Review Method

(1) Document Review

Facility documents, such as business directions and expectations, manuals and relevant documents, for each review item were explained by facility personnel and reviewed by the team

(2) Interviews

55 people including the president, managers, and personnel responsible were interviewed. Also, questions based on document review were asked to facility personnel.

(3) Observation

Along with items confirmed through document review and interviews, several activities of the Company were observed.

In addition, the review team discussed with NDC personnel by providing industry best practice which would be good reference for NDC while carrying out document review, interviews and observations.

6.2 Report of Review Results

Good practices and areas for improvement were developed based on the results of document review, interviews, and observations with regard to each review area.

"Good practices" shall be defined as "exemplary, effective, and unique practices and/or processes of the facility that ensure safety and are worthy to be widely shared with JANTI members and those in nuclear power industry."

"Areas for improvement" shall be defined as "suggestions for further improvement/refinement of reviewed facility's activities made through the comparison with industry best practices, in order to achieve the excellence in nuclear safety." Due to this definition, areas for improvement are sometimes made even though the current activities are above the average of nuclear industry

standards.

7. Summary Interview with President

The review team interviewed the President in order to understand the senior management policies. His thoughts are shown as follow:

(1) Nuclear safety at NDC

Ensuring nuclear safety is essential for NDC to continue to exist. NDC is the only company in the Mitsubishi Heavy Industries Group that handles radioactive material. We always address the work of research and development with an awareness of potential risks. We experienced the increase of radiation monitors in our site when there was a criticality accident at JCO because NDC is located close to JCO. I think it was the experience that diffused a sense of nuclear safety as the highest priority among the employees.

If something should happen, it would result in problems not only for NDC, but the nuclear industry of Japan and in some cases, of the world. We have the employees keep in mind that ensuring the nuclear safety is everything to us. We just do the right things in the right way as a matter of course. We do not accept the status quo blindly only because nothing has happened.

I think NDC has established an appropriately system to ensure nuclear safety, however, we should make further improvement gradually by looking for problems in the workplace. Even though the each improvement may be small, continuous improvement will result in significant change even though the improvement is small. There is no sense in making quick forceful changes. To this end, I say to the employees that they should scrupulously acquire training, improve their skills and knowledge, and conduct themselves with pride in their work.

(2) Specific activities to cultivate a safety culture

In cultivating a safety culture, what should be done depends on the level in

the organization that the personnel belongs: the top level management, the managers and workers. The NDC Company Policy and the Guideline of Employees' Behavior, which is the company's action plan, are written to spread an awareness of the importance of ensuring nuclear safety among all the company's employees. We believe that the safety culture will be fostered by carrying out duties steadily in accordance with these plans.

One of the specific efforts to cultivate a safety culture is, for instance, the messages from the top management to employees through the addresses at installation ceremony of CEO, new year ceremony, and safety week as well as through the in-house website. Another example is meetings set up on a variety of levels, such as senior management meeting, division and department managers meeting, and employees meeting. These meeting allow personnel to hear from the top level management. Communication within the workplace is also enhanced through these meetings.

(3) Dissemination of president policy to the work site

All managers are requested to disseminate the president's policy in the work site.

I visit the work site as much as possible. I believe that a safety culture starts with the morning meeting at the beginning of the day. Therefore, I participate daily in the morning assemblies of the Testing Department and the Safety Management Office. I also deliver lectures four times a year.

I also join the Health and Safety Committee Patrols and the Pre-work safety verification activities (KYK). Even if the president does not say anything, just my presence serves to raise the motivation of employees.

(4) Reporting culture

I strive to create the atmosphere in the workplace that allows employees to discuss frankly. It is important that personnel do not keep silent when something would happen. I see to it that reporting, contact, consultation and communication are always conducted in an active manner. I do not impose penalties on those who bring forward issues, but commend them because we

learn from problems or consider them as opportunities for improvement. I think that we have a culture where even negative information is easily communicated. Even minor near-miss events are reported.

(5) Strength and confronting issues

Since NDC is the only organization which possesses a hot laboratory within Mitsubishi Heavy Industries, Ltd., we are able to advance research and development of radioactive materials and send those results out.

There are three issues we are facing.

The first is knowledge management. There are many employees near the age of 60. In preparation for the retirement of these experienced personnel, we are conducting “e-Tradition Activity” (activity digitalizing the knowledge) to pass on the knowledge of experienced personnel, and the activity to enhance our unique technical knowledge considering ten years ahead.

The second is measures concerning aging facilities. Most of our facilities are unique and, in case of failure, it is hard to acquire replacement. We will develop a medium-term plan by April of this year and address this issue systematically.

The third is developing capabilities of personnel and securing personnel.

(6) Performance status

A company activity plan is prepared annually. Based on this plan, each department formulates its own plan and undertakes its work. A follow-up is conducted at the half-year mark and the plan is recapitulated at the end of the fiscal year. The same thing is done with the training plan.

Also, risk management is implemented by the Safety and Health Committee. In order to diminish risks, we are scrupulously implementing the Pre-work safety verification activities (KYK), taking countermeasures against other company's events and so on. Additionally, when installing new facilities or equipment, we examine risk reduction within the context of validation activities before and after research and development operations as well as KYK.

With regard to the zirconium fire which occurred the other day at Mitsubishi

Nuclear Fuel Co., Ltd., we conducted reproducible experiments to acquire knowledge and had a real feeling for the risks so as to raise our safety consciousness.

(7) Expectations for management

I expect the managers to appropriately convey the president's ideas to those actually doing the work. Also, I want them to steadily implement safety activities without cutting corners. As I stated previously, I want them to strive to improve while always wondering if things are really all right, and be sufficiently aware of the importance of reporting, correspondence, consultation and communication.

(8) Addressing recent events

Although there have been few events at our company, they have occurred. Therefore, we are conducting in-depth investigation regarding the causes of the events implementing countermeasures to prevent reoccurrence and similar events. We do the same with events occurred at other companies.

With regard to insufficient checks becoming the cause of nonconformance, I am considering the tasks which we should address. The key issues for this year are the steady implementation of PDCA, preventing the occurrence of nonconformance, and properly responding to matters indicated by regulatory inspections or other external bodies.

(9) Expectations for peer review

I expect that by having an outside perspective, the peer review will provide us with instructive indications regarding aspects which the participants on site do not notice.

Also, I think the peer review will create an air of tension bearing on the employees' safety consciousness and it is a good opportunity for reconsidering our own actions. Moreover, I would like to ask that it be used as an opportunity for enhancing the compliance awareness of our new employees.

(10) Others

Since assuming this post at NDC, considering my experience in areas other than nuclear power in the past, I realized afresh that anybody involved in nuclear power industry, are earnestly addressing the work without cutting corners. Accordingly, since becoming president, it has been my intention not to make sudden forceful reforms, but make small improvements and continue these unceasingly so that major changes will take place before long. I continue to treasure the culture here that my seniors ardently built and will make this an even better company.

8. Synopsis of Review Results

At NDC, the idea of "prioritizing nuclear safety" is stipulated in the company policy and other statements. This idea is spread throughout the entire company through daily activities from the top level to managers and the personnel responsible. Since the top level and managers frequently visit the work site to convey messages and communicate, a workplace with a good open atmosphere has been created and a climate is in place where anything can be reported. It is expected that the company will maintain a high awareness of nuclear safety in the future as well. In addition to the current activities, it is desirable for the company, as a means for further raising this awareness, to enhance the systematic recognition of activities so as to foster a safety culture as well as formulate and implement new approaches and policies for the same activities.

At NDC, there have been few occurrences of nonconformance events. The company diagnoses the causes of each event and adopts measures to prevent a reoccurrence. With regard to events which occur externally, the company also faithfully takes countermeasures. Furthermore, attempts are made in research and development operations to prevent nonconformance by creating rules for the administration of review meetings (FRM, ORM) by the relevant departments and sections before and after the commencement of research and development. Minor failures are reported orally and the necessary measures are adopted, but it is desirable to lead to the prevention of the occurrence of major events by recording, analyzing and effectively utilizing such information.

Also, NDC is an organization of experts possessing specialized skills and is facing the issue of securing personnel and handing down technical knowledge due to the aging of its employees. The e-Tradition Activity is being promoted for the purpose of transmitting technical knowledge and accumulating specialized techniques. It is being improved for use and the expectation is that it will be a continuing effort as well.

Listed below are one good practice and four areas for improvement extracted as specific review results.

Please note that these areas for improvement do not need to be responded to immediately for nuclear safety.

8.1 Good Practices

(Organization/administration)

None in particular

(Education/training)

None in particular

(Work management/maintenance)

- Activities to prevent nonconformance in research and development operations

In the research and development operations, there are review meetings [FRM (front loading review meetings) and ORM (outlet review meetings)], which are preventive measures and activities implemented in order to prevent nonconformance. FRM and ORM deduce potential challenges in new areas, new equipment and facilities and so forth, and are effective as a means for adopting countermeasures in advance.

The Research and Development Department prepares a work plan prior to commencing research and development. In the FRM, diversified opinions and requests of the relevant departments are compiled and integrated into the work plan from the perspective of safety and quality regarding the system, devices, procedures, and so forth. Then, development and testing is implemented. After the conclusion of the research and development, the effectiveness of the preventive measures examined in the FRM and the appropriateness of the research and development results are verified during the ORM.

(Radiation protection)

None in particular

(Key issues)

None in particular

8.2 Areas for Improvement

(Organization/administration)

- Further enhancement of activities to cultivate a safety culture

There is an adequate awareness from the top level of the company down to the personnel responsible regarding the importance of nuclear safety. This is regarded as something fostered through everyday operations. In addition, one factor is thought to be also the experience of responding to an emergency as the monitors inside the establishment went up during the JCO criticality accident.

In order to maintain and improve the present high level of awareness regarding nuclear safety, it would be desirable to systematically consolidate the activities for cultivating a safety culture and formulate new approaches and policies and implement them.

(Education/training)

None in particular

(Work management/maintenance)

- Control of operator aids in the work site

Various operator aids, such as "wiring diagram" on the distribution panel and "use prohibited" on the testing equipment, exist within the facility. However, they have not been controlled with such information as issue date, expiration date, and name of personnel responsible.

Unless the operator aids on this testing equipment are controlled, this could lead to misuse of the equipment. Therefore, it is desirable to have the operator aids appropriately controlled.

(Radiation protection)

None in particular

(Key issues)

- Analysis and effective utilization of minor internal events to prevent events from

occurring

Comparatively major events including nonconformance are properly reported, their causes are analyzed, measures to prevent reoccurrence are undertaken and they are recorded. On the contrary, although minor events are reported to the superior on such occasions and the necessary measures are taken, efforts such as recording the minor events for the entire organization and analyzing the trends and similarities are not adequately undertaken.

With regard to minor events as well, it is desirable to record and analyze their trends and similarity in order to prevent the occurrence of major events.

- Further enhancement of analysis of the causes of nonconformance events

The frequency of nonconformance at NDC is low and major ones have not arisen. Also, for the nonconformance which has occurred, the major causes have been identified and measures to prevent reoccurrence have been adopted to the relevant equipment as well as similar equipment. However, it is difficult to say that a systematic analysis of the causes of events is being conducted.

In order to implement more effective measures to prevent failures from occurring, it is desirable to have a complete analysis of the causes with reference to analytical methods recognized by academia or industry.