

Overview

1. Introduction

This report summarizes the results of the peer review (hereafter referred to as "review") conducted at Nuclear Fuel Industries, Ltd. (NFI). 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

NFI was founded in July 1972 as a comprehensive manufacturer of nuclear fuels to carry out research & development, design, manufacturing, and plant engineering in regard to nuclear fuels. It is the only company in Japan capable of fabricating the two types of light-water reactor fuels; boiling water reactor (BWR) fuels and pressurized water reactor (PWR) fuels. The company owns two plants; the Tokai Works, which mainly fabricates BWR fuels, and the Kumatori Works, which mainly fabricates PWR fuels.

The Tokai Works, for which the review was conducted, commenced commercial operation in January 1980. As a nuclear fuel fabrication facility, the plant has both "processing facilities" and "utilization facilities" per Law for the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors. As of April 2008, the number of employees was 212.

At the "processing facility," BWR fuel assemblies and PWR gadolinia fuel pellets (for Kumatori Works) are fabricated. Totally 15,000 BWR fuel assemblies had been fabricated by 2007. It should be noted that at the time of the first peer review, the "processing facility" also had fabricated advanced thermal reactor (ATR) fuels, but since the advanced thermal reactor Fugen power plant was shut down, ATR fuel fabrication was halted.

The "utilization facility" is the facility to fabricate high temperature gas reactor (HTR) fuels along with the operation of the high temperature gas reactor at the Japan Atomic Energy Agency (JAEA) O-arai Research and Development Center. Currently, maintenance

of the fuel production facility and storage of the fabricated fuels are carried out.

3. Review Viewpoint

Two peer reviews have been carried out on NFI until now; the first on the Tokai Works (then known as the Tokai Manufacturer) from May 23 to 26, 2000 and the other on the Kumatori Works from January 27 to 30, 2004. As this was the second review on the Tokai Works, the focus was mainly put on the changes in processes made after the previous review.

The Tokai Works puts top priorities on environmental protection, industrial safety and health, production quality, and nuclear safety quality, and the plant has earned quality management system (ISO9001) certification, environmental management system (ISO14001) certification, and occupational health and safety management system (OHSAS18001) certification.

In addition, countermeasures are taken to prevent recurrence of "inappropriate handling of uranium" on February 24, 2007. At that time, uranium in excess of the limiting value of technical specification was handled.

Based on the above, the focus was put on the following points in the review.

- endeavors in promoting safety culture
- penetration of the Plant Manager's policies in fuel fabrication and development of design & technology
- training of fuel fabrication engineers
- reflection of operating experience regarding PWR and BWR fuel fabrication
- passing down of HTR fuel fabrication techniques
- status of endeavors concerning "inappropriate handling of uranium"

Specifically, the four areas of "organization & management," "training," "work management & maintenance," and "radiation protection," and the three important issues of "criticality safety," "non-conformity management and prevention of human errors," and "risk management" were reviewed.

4. Conducting the Review

(1) Review dates

May 14 (Wed) to May 16 (Fri), 2008

(2) Review team composition

Team leader: JANTI NS Net Division

Team members: one from Sumitomo Metal and Mining Co. Ltd., one from JCO Ltd.,
and three from JANTI NS Net Division

(3) Allocation of review group assignments

Group A: organization & management, important issues

Group B: training, work management & maintenance (WM & MA), radiation protection

5. Review Schedule

		Group A (organization & management, important issues)			Group B (training, work management & maintenance, radiation protection)		
May 14 (Wed)	AM	Review Team Meeting, etc. (60 minutes)					
		Opening (Greetings & Introduction of Members) (30 minutes)					
		Interview with Plant Manager (60 minutes)					
	PM	Overall		document review (30 minutes)	Overall		document review (30 minutes)
		observation of meeting	disaster prevention management meeting	event observation (60 minutes)	on-site observation		on-site observation (90 minutes)
		organization & management	management class, member class	interview (150 minutes)	training, WM & MA	management class member class	interviews (120 minutes)
		Review Team Meeting (60 minutes)					
meeting with host coordinators	confirm results of review confirm plan for day 2, etc.	(30 minutes)	meeting with host coordinator	confirm results of review confirm plan for day 2, etc.	(30 minutes)		
May 15 (Thu)	AM	observation	meeting	event observation (30 minutes)	observation	meeting	event observation (30 minutes)
		organization & management	management class, member class	interviews (180 minutes)	observation of on-site patrol		on-site observation (60 minutes)
					training, WM & MA	management class member class	interviews (120 minutes)
	PM	on-site inspection patrol	safety and health promotion committee	event observation (60 minutes)	training radiation protection	management class, member class	interviews (120 minutes)
		important issues	management class, member class	interview (150 minutes)	training, WM & MA	management class member class	interviews (120 minutes)
		Review Team Meeting (60 minutes)					
		meeting with host coordinator	confirm results of review confirm plan for day 3, etc.	(30 minutes)	meeting with host coordinator	confirm results of review confirm plan for day 3, etc.	(30 minutes)
May 16 (Fri)	AM	[confirm findings] (150 minutes) /make final adjustments with host / review final closing report documents					
		closing preparations (30 minutes)					
	PM	closing (explanation of results, etc.) (60 minutes)					

6. Review Method and Method of Summarizing Review Results

6.1 Review Method

(1) Document Review

Policies, procedures and other related documents were reviewed accompanied by the facilitative explanation and presentation for each review item.

(2) Interviews

Interviews on the theme of "endeavors in nuclear safety arena" were carried out with approximately 25 persons including the Tokai Works Plant Manager, managers and members. Also, uncertainties arise in the document review were clarified in the follow-up interviews.

(3) Observation

In the review, activities carried out in the plant were observed.

In addition, while the review groups were conducting observations, interviews, and document reviews, discussions were made to exchange information between the review team and the plant people regarding reference information and examples of "best practices" employed in the nuclear power industry which would be applicable to the plant.

6.2 Method of Summarizing Review Results

“Good practices” and “areas for improvement” were identified based on document reviews, interviews, and observations for each review item.

"Good practice" is defined as "an outstanding practice or process in the safety related plant activities which contributes to the good performance with accuracy, effectiveness and originality. Accordingly, it is worth being shared not only with other JANTI members but also with whole nuclear power industry.”

"Area for improvement" is defined as "suggestions for further improvement in the activities to enhance nuclear safety of the plant in contrast with the best practice employed in nuclear power industry to achieve excellence.” Accordingly, areas for improvement

can be suggested even when the performance of the plant activities is better than the standard level in the nuclear power industry.

7. Summary of interview with Tokai Works Plant Manager

In order to understand the policies of the plant top management, the review team interviewed the Tokai Works Plant Manager, who expressed his thoughts as follows.

1) Nuclear safety at NFI

Safety is assured at this plant from the following four perspectives.

- Quality of safety assurance activities to meet nuclear safety regulation (JEAC4111)
- Product quality assurance to ascertain integrity of fuel at nuclear power stations
- Assurance of health and industrial safety of both employees and contractors
- Preservation of the surrounding environment (not only from the perspective of radiation protection, but also paying attention to vibration & noise that are important for local residents to feel relieved, including PA activities).

A management system has been created in order to steadily carry out activities from each of the above perspectives, and each step is implemented in accordance with the manuals.

2) Endeavors in the promotion of safety culture

- Everyone at the plant is working diligently to assure transparency so that the outside bodies and people can feel relieved for the plant activities.
- Mind of employees is critical. In addition to just complying with the rules, the understanding should be reinforced that compliance is essential to assure safety.
- Many workers have in-depth understanding of their work, since the management understands and explains importance of understanding thoroughly at morning meetings and during trainings.
- Since current level of attitude and awareness for safety culture is not satisfactory, continued effort is needed in promoting safety culture hereafter.

3) Reinforcement of Tokai Works Plant Manager's policies to the work-sites

- Policies are posted at the work-sites and each worker carries a safety booklet listing

the policies

- At the beginning of the calendar year, beginning of the fiscal year, beginning of the second half of the fiscal year, and during nuclear energy safety month, all workers are assembled in the cafeteria and the safety quality policy is explained. In addition, topics such as preventive measures for earthquakes and events of other companies are also explained.
- The Plant Manager makes a work-sites observation patrol once a month at the time of the Health and Safety Committee meeting. He also takes part in safety events including work-sites observation patrols.
- The company president also makes work-site observation patrols when visiting the plant for the Safety Committee meetings three times per year and for executive board meetings. (totally five to six times per year)
- The “5S” practice of “sorting out” (“Seiri” in Japanese), “orderliness” (“Sei-ton” in Japanese), “cleanliness” (“Sei-ketsu” in Japanese), “cleaning” (“Sei-sou” in Japanese), and “discipline” (“Shi-tsuke” in Japanese) are on the consciousness of workers at the work site. When “5S” related problem is observed, the worker in charge is cautioned on the spot, and the caution report is prepared to let the department manager be informed.

4) Reporting culture

- Reporting from the work site is sufficient, and any non-conformities or mistakes are brought up to the Plant Manager without fail.
- At the end of last year, when a short-circuit occurred in the emergency generator during maintenance, the Plant Manager not only went to the work site to check the situation, but also participated in the discussions regarding the cause and countermeasures. The Plant Manager has looked at the work site himself, which helped him to sufficiently understand the appropriateness of the reports on the corrective measures.
- When non-conformities or mistakes are reported, the Plant Manager makes every effort to relieve the person(s) in charge. While keeping in mind to avoid personal denunciation, he makes efforts to get to the root cause.
- Each of the general managers in charge of equipment make effort to report anything out of the ordinary, but there are no explicit reporting criteria and so it is possible that

the threshold may vary according to each general manager. In any case, things that need to be reported are not neglected.

5) Fields in which the Tokai Works excels and issues confronted

- One of the characteristics of NFI is the awareness of adherence to the established rules, which has been followed very honestly. On the other hand, there is also a tendency not to take actions positively toward improving rules or equipments when surrounding circumstances change. Thus, the tendency of adherence to the existing rules might be considered as weakness. Since a greater number of suggestions for improvements is expected, MD (“Muda-Dori” in Japanese means “removal of ineffectiveness”) activities have begun this year.
- As for the confronting issues, further cost reduction is expected due to the competition with domestic and overseas fuel fabricators, and due to the rapid increase in the price of raw materials. However, it should be noted that the company president has stated, "Never forget that safety comes first." Thus, the expected task is to best balance safety with costs.
- The company is proud of its ability to fabricate both BWR and PWR fuels.

6) Performance of Tokai Works

- It is confirmed whether or not sufficient measures are implemented for findings and suggestions made during regulatory inspections or internal audits, and for the plant operations and equipment performance.
- It is confirmed by the Health and Safety Committee whether or not there are any abnormalities in parameters. It is also determined by the Nuclear Fuel Safety Committee as to whether or not there needs to take preventive measures for the events or troubles occurred at other companies.
- Product quality is confirmed through the management reviews four times per year, internal quality audits, and findings by customers.
- Each department establishes three to four annual objectives, and makes endeavors to achieve them accordingly.
- Proactive endeavors are also being made for earthquakes and fire-protection.

7) Expectation for the managers (all general managers, section managers, etc.)

- The managers are expected to be more concerned with the attitude and awareness at the work site, and to make a little more effort toward enhancing mutual understanding. However, as this expectation has not been explicitly announced as special message, this is a subject for the Plant Manager to reflect on.
- There is a plan to dispatch operators to the Japan Nuclear Fuel Ltd. (JNFL) MOX fuel fabrication plant, and managers are requested to train engineers and multi-skilled workers.
- Approximately 30 employees throughout the company have already been on loan to JNFL. As those personnel will return in the future, it is not to be judged to increase the number of personnel due to the cost issue. Therefore, the skill training is important. The Rokkasho MOX fuel fabrication plant is being regarded as the third plant of NFI.

8) Passing on skills

- Contrary to the worldwide trend, the company is not faced with the baby-boomer generation retiring en-masse, but there is still the problem of a gradual loss of skilled workers. Therefore, efforts are being made to pass down skills including training of multi-skilled workers. A database of critical skill or know-how is being compiled, and the status of development of multi-skilled workers by means of SD (Skill Development) training is monitored.
- As far as HTR skills are concerned, both the passing down of skills and equipment condition are maintained through the short-term operation of the equipment at regular intervals.

9) Expectations for the Peer Review

- Finding of any "weakness" from a different perspective which has not been identified by the plant is expected.

8. Summary of Review Results

With regard to safety, the Tokai Works endeavors in "maintaining transparency," "reinforcement of awareness of legal compliance," "open communication," and "reinforcement of prompt reporting" from the four perspectives of "quality of nuclear safety,"

"product quality," "industrial and health safety," and "preservation of surrounding environment."

A high degree of awareness of disaster prevention is a characteristic of the Tokai Works. When an earthquake with Japan Meteorological Agency scale 4 occurred in the Mito & Tokai area at midnight of May 8, 2008, more than 70 employees gathered promptly to the plant. Emergency drills are carried out under realistic assumptions such as with no advance notice and absence of the responsible persons. Disaster prevention endeavors such as these contribute to enhance "my plant" awareness and strong sense of responsibility, and we believe this will be useful in the event of a major earthquake in the future.

Also, in order to dispatch engineers to the planned Rokkasho MOX fuel fabrication plant in Aomori Prefecture in the future, training of engineers and development of multi-skilled workers are actively in progress. Approximately 30 employees throughout the company have already been on loan to JNFL.

Accordingly, from observation of the "Disaster Prevention Management Committee" and "Industrial Health and Safety Promotion Group On-site Patrol," and from interviews with managers and personnel, we have come to understand that the day-to-day efforts are made by workers to improve safety, emergency preparedness, and engineering skill.

However, in order to continually pursue further improvement in safety, coordinated and systematic actions are needed. Currently, the clear message has not been issued from the Tokai Works top management towards the whole organization regarding the specific action plan for systematic continuous improvement of safety.

In the review, six good practices and five areas for improvement were identified which are listed below. It is noted that none of identified areas for improvement need immediate action from the standpoint of maintaining nuclear safety.

8.1 Good Practices

(Organization & Management)

- **Management support for taking substantial efforts to resolve problems**

During the safety patrol, falling risk had been pointed out at the opening of the fuel assembly equipment installed in 1980. Since regulatory permission and a large amount of budget are required to remove the risk by implementation of design change, posting was placed to show warning message as the countermeasure, instead. However, because there

was a strong expectation from the work site for improvement, the improvement plan was established by taking the opportunity of introduction of the "industrial safety and health management system" in 2003. Then, the modification was implemented for the openings over a period of three years to completely remove the falling risk.

Even in the case of difficult problems that require allocation of a great deal of time and personnel hours, when the senior management show the initiative to resolve the problem and show leadership to take effort for improvement, each individual will be motivated for improvement, accordingly. We believe this kind of attitude will lead to the promotion of safety culture within the company.

- **Making effective use of near-miss and human error events information through the participation of all employees**

Since November 14, 2001, no accidents occurred with loss of working-day at the plant for more than six years. As part of the "zero accident" activities, risk forecasting training ("KYT", abbreviation of "Kiken Yochi Training" in Japanese) is carried out at least twice a month at all worksites making use of examples of near-miss and human error events experienced at each person's own work site. Those events information are input into the database so that they can be utilized in KYT activities at other worksites through intranet. Not only the personnel in engineering departments but also employees in administrative departments participate proactively in collecting those events information. Thus, the activity is made under the cooperation of the whole plant. In addition, the various safety activities carried out by each group are summarized in the monthly report to enhance safety awareness. These activities greatly contribute to the continuation of zero accidents with loss of working day.

(Training)

- **Fostering social responsibility through training**

Not only compliance to the laws and safety regulations but also earning the trust of the general public are strongly emphasized in the safety trainings. Regarding the safety training scheduled in January 2008, it had been determined at the plant's Nuclear Fuel Safety Committee that "Responsibilities that the company ought to fulfill with regard to nuclear safety" should be focused at the training for the participants to be sufficiently understood. Then, television news article on "inappropriate handling of uranium" was

broadcasted in the training, and the participants were questioned "Can you convince the people who watched the program on television of the plant safety?" We believe that the continuation of these actions is effective in preventing the obsolescence of the lessons experienced in the past.

(Work Management & Maintenance)

- **Visualization of work procedures**

A set of work procedures has been established for all routine field work. In addition to the description for each work step, the work procedures also contain columns of "points" and "cautions" to provide hints and intuitive insights based on experience and expertise accumulated up to now, and points of caution from the perspective of safety and management. A copy of the work procedures is kept at each work site, and is accessible via intranet. Also, in addition to the written description, pictures and flow charts are being incorporated for the applicable work step based on the importance of the work procedures. Through these efforts, the procedures become more attractive to the workers with visual contents, and are utilized more frequently as an effective tool in the on-site trainings.

(Radiation protection)

Nothing in particular.

(Important Issues)

- **Prompt response to earthquakes**

When an earthquake with Japan Meteorological Agency scale 4 or more occurred in the Mito & Tokai area, the emergency response team was summoned by means of e-mail message and calls to mobile phones and the essential personnel gathered at the plant. When a quake occurred at 1:45am on May 8, 2008, the person on duty activated the telephone alert mechanism and summoned the team at 1:48am, three minutes later. The first member arrived the plant at 1:53am, and totally 73 employees were gathered. Then, the message for the completion of the inspection was reported to outside body at 2:46am.

Despite the earthquake occurred after midnight, more than 70 personnel assembled in a short period of time, and the rapid response can be made, accordingly. We believe that such response to earthquakes results from the high sense of responsibility and "my plant"

consciousness, and that this will act effectively if a major earthquake might hit the area in the future.

- **Implementing disaster prevention training under realistic assumptions**

The Tokai Works conducts a comprehensive emergency drill annually, and each individual team of the emergency response brigade conducts team-by-team exercises twice per year. The comprehensive emergency drills are carried out under the realistic assumptions based on evaluation and reflection on drills carried out in the past. The details of the drill scenarios are not notified to the participants in advance, and the situation of holidays and nighttime is simulated by assuming that team leaders are either absent or late in arrival. In the team-by-team exercises, each individual response team determines what it needs to do and makes its own preparations and devices, resulting in training that is quite effective. By accumulating this kind of experience, we believe that the capability of those emergency response personnel is enhanced to prove its effectiveness in case of emergency situation.

8.2 Areas for Improvement

(Organization & Management)

- **Communicating information accurately at work-site morning meetings**

Each group at work site has a daily morning meeting before the start of work. The attendants are not only the group members or workers, but also the group leaders in charge of management. In the meetings, work plan of the day, witness inspection plan, patrol plan, important items to communicate, and the precaution points from "3H" of "first time" ("Hajimete" in Japanese), "difference from the previous time" ("Henkou" in Japanese), and "first time recently" ("Hisashiburi" in Japanese) perspectives are communicated. In one of the morning meetings observed by the review groups, although the noise level was high at the work site so that it was difficult to hear what the speaker was saying sufficiently, confirmation was not made for the communicated contents through repeating back the message. Since this is the place where important meetings take place every day, it is desirable for measures to be implemented so as to make it possible for all members to be able to accurately hear what is being said.

- **Further enhancement of activities to promote safety culture**

Activities for improving the reliability and safety of products and production facilities are put into practice in the daily safety activities by maintaining transparency, consciousness of legal compliance, smooth communication, and prompt reporting. In order to continually pursue further improvement in safety and reliability, it is important to implement coordinated and systematic actions so as to firmly foster awareness of nuclear safety within the organization. However, the clear message has not been currently issued from the Tokai Works top management towards the whole organization regarding the specific action plan for systematic continuous improvement of safety.

Therefore, the Tokai Works should plan and put into practice a new set of policies and action plans.

(Training)

- **Reflecting feedbacks from the participants in the training**

Taking the opportunity of safety training and ethics training, enhancement of safety awareness is pursued in accordance with the policies determined by the plant's committee. Meanwhile, there are no specific actions taken to collect feedbacks from the participants after the training. When the trainings are conducted, it is preferable to collect feedback from the participants by means of questionnaires etc. in order to incorporate the expectation of the participants to improve the training effectiveness.

(Work Management & Maintenance)

- **Further consideration for the housekeeping of the work site**

In the plant, fuel fabrication facilities are installed relatively compact manner, and the space in the work site is allocated minutely such as the movable zone for the carts and the placing zone for components. Meanwhile, there is room for improvement with regard to the way of housekeeping in a few cases.

For instance, the area where some fuel components are placed in cardboard boxes is not posted specifically.

- **Improvement of efficiency in awareness of posting**

At the fuel fabrication work site, the limiting amount of nuclear materials for equipment that uses uranium is posted in a conspicuous way. The posting is large enough and

located in a place with sufficient visibility, and the prohibited actions when uranium is brought into the equipment are clearly indicated. Meanwhile, there is room for improvement to enhance the effectiveness of awareness on a few postings at the fuel fabrication work site.

For instance, for some postings showing the boundaries of radiation controlled area in the fuel rod storage room, it is desirable to improve visibility by consideration of size, color, etc.

(Radiation protection)

Nothing in particular.

(Important Issues)

Nothing in particular.