Summary

1. Overview of the Reviewed Establishment

1.1 Overview

The peer review team of the Japan Nuclear Technology Institute (hereafter, JANTI) conducted a peer review (hereafter, review) at Hamaoka Nuclear Station (hereafter, station) of Chubu Electric Power Co, Inc. from Friday, February 2, 2007 to Friday, February 16, 2007. The station has four conventional boiling water reactors (BWR) (Unit 1 through 4) and one latest advanced boiling water reactor (ABWR). Unit 3 and 4 were in operation with rated thermal power output and Unit 5 was also in operation with rated thermal power output since February 13 after restarted on February 8 during the review period.

The station has 618 personnel 2,148 employees of contractors (as of the January 1, 2007).

Unit	Rated Electric Output (MWe)	Commercial Operation Started	Operating Performance (As of the end of July 2006)	
			Electricity Generated*1 (billion kWh)	Capacity Factor*2 (%)
1	540	March 1976	77.78	51.4
2	840	November 1978	134.41	63.7
3	1100	August 1987	147.61	77.4
4	1137	September 1993	111.46	81.2
5	1380	January 2005	19.73	61.9

*1) Electricity Generated: Including the commissioning (trial operation) period

*2) Capacity Factor: Since commercial operation started

1.2 Conditions surrounding the Station and its activities to deal with them

The station is located in a flat coastal area at the southern tip of Shizuoka Prefecture, facing the Sea of Enshu.

At the station, Unit 1 and 2 have been shut down for a long time to replace core shrouds and improve seismic safety margins. Unit 5 had been shut down until the beginning of February 2007 due to low-pressure turbine blades damaged in June 2006.

On the other hand, Chubu Electric Power Co., Inc. recognizes that they have lost the trust of local communities due to a series of problems since the piping rupture accident that occurred at the

residual heat removal system of Unit 1. To regain the lost trust, it is necessary to provide transparent and easy-to-understand explanations, being aware that they are keenly watched by external parties. Accordingly, they have been engaged in daily operations, realizing that it is essential to fully disclose information concerning the operation of the station.

Since 2004, they have registered three times as much “problem and maintenance quality information” as before with NUCIA (Japanese Operating Experience database provided by JANTI). In addition, they have actively been publishing 20 to 30 pieces of “other information” of the station annually, which is not related to problems and maintenance quality. The enthusiasm of the station is also represented by the fact that they have reported more than 120 pieces of information in total over the last three years.

Moreover, to share the spirit and values of “getting acquainted with the workplace where one works and other shop floors within the plant, and attending to the task and equipment of which one is in charge with a true sense of fondness, thereby improving the quality” and, by the same token, improve the quality of the station. Not only the plant personnel but also the employees of contractors have been engaged in “My Plant Promotion Activities.”

It is worthy of special mention that the station is actively endeavoring to improve seismic safety margins by proactively coping with the revised Guidelines for Seismic Design Examination.

2. Review Schedule

After reviewer training and preparations at the JANTI office from Wednesday, January 30, 2007 to Thursday, February 1, 2007, the review was conducted at the station for about two weeks from Friday, February 2, 2007, as shown in Table 1.

Table 1: Review Schedule at the Station

		Review Description
Friday, February 2	(Morning)	・ Entrance meeting (introduction of the review team and the station counterparts, briefing of plant operating status and issues)
	(Afternoon)	・ Observation of plant equipment conditions, etc. ・ Schedule arrangement with the counterparts in each review area
Saturday, February 3 Sunday, February 4		Day off
Monday, February 5		・ Observation of plant equipment conditions and field, interviews, document reviews, and exchange of views on results with the counterparts ・ Team meeting including the station representatives
Tuesday, February 6 Wednesday, February 7 Thursday, February 8 Friday, February 9		・ Field observations, interviews, and document reviews, and exchange of views on results with the counterparts ・ Team meeting including the station representatives
Saturday, February 10	(Morning)	・ Team meeting (to discuss Strengths and Areas for Improvement (hereafter, AFIN))
	(Afternoon)	・ Analyzing observations in each review area
Sunday, February 11 Monday, February 12		Day off
Tuesday, February 13		・ Field observations, interviews, and document reviews ・ Discussing the causes and contributors of problems with the counterparts ・ Confirming and discussing the facts concerning Strengths and AFINs ・ Team meeting including the station representatives
Wednesday, February 14		・ Discussing with the counterparts in each review area ・ Managing representative, team leader and the station representatives to discuss Strengths and AFINs ・ Team meeting including the station representatives
Thursday, February 15		・ Review and finalize Strengths and AFINs ・ Preparing for the exit meeting
Friday, February 16	(Morning)	・ Exit meeting (review team to explain Strengths and AFINs and give supplementary explanations as requested by the station)
	(Afternoon)	・ Press conference organized by JANTI (at Hamaoka Nuclear Exhibition Center)

3. Review Methodology

The objective of review conducted by JANTI is to promote the highest level of excellence in the operation, maintenance and support of operating nuclear power plants.

3.1 Review Process

The “Performance Objectives and Criteria” (PO&Cs) used for World Association of Nuclear Operators (WANO) Peer Review were applied to the review as a standard.

These criteria are guidelines for leading the way to promote highest level of safe and reliable nuclear power plant operation. In this review, they were used to identify “Strengths” and “Areas for Improvement Needed”.

Strength is a significant beneficial practice, activity, or process employed by a station that results in achieving a high level of performance or desired high quality results and benefits. On the other hand, AFIN is a problem or vulnerability that needs to be resolved to enhance the ability of the station to safely and reliably operate the plant and to make and sustain future improvements. Identified AFIN is for worthwhile improvement from the standpoint of excellence, but does not always mean insufficient, inappropriate nor poor performance compared with industry standard.

The review team conducted the review as described below, focusing on field observation and closely exchanging opinions with the counterparts in accordance with the INPO[*4] review methodology.

*4) INPO (Institute of Nuclear Power Operations) was established by the U.S. nuclear electric utility industry, following the Three Mile Island accident in 1979. It is an organization that is reviewing nuclear power stations in U.S. periodically. The main process of INPO review is field observation conducted at station for two weeks. It is known world nuclear industry-wide that INPO has contributed a great deal to improve safety and reliability of U.S. nuclear power stations since the 1990s.

3.1.1 Collecting information

First, all reviewers conducted plant walkdown and observed equipment conditions in the areas assigned to each of them. The number of white cards on which they wrote down issues they noticed during walkdown amounted to 240. Some of the items written on the cards extend over several review areas. Sorting them out by appropriate review area, there were approximately 116 cards in Operations area, 99 in Maintenance, 42 in Engineering Support, 19 in Radiological Protection, and so forth. These cards were distributed to each review area and used as a starting point of the review.

Subsequently, the review started in each area separately. Specifically, two or three reviewers formed a team in each area to observe plant equipment conditions and daily activities of the station personnel including employees of contractors. Each reviewer conducted field observations elaboratively in accordance with the review plan drawn up in advance, followed by interviews and document reviews. Reviewers judged whether the obtained information was important or not based on the review criteria (PO&Cs) and their own experiences. The significant facts identified in the observations, interviews, and document reviews were recorded as excellent or problematic examples for further deliberation. The Review team frequently exchanged opinions on these facts with the counterparts and, if necessary, employees of contractors.

The results of the above activities were introduced and discussed if it should be determined as either excellent or problem based on each team member's experience and the best practice in the industry at the daily team meeting (held for an hour 5:00 p.m.).

3.1.2 Analyzing information

Reviewers in each area identified excellent and problematic practices in comparison with the review criteria (PO&Cs). Among these, excellent practices were put together as Strengths, including the necessary information so as to provide reference for other stations.

On the other hand, problematic issues were further analyzed and discussed to clarify what the problem nature was, why they occurred (analysis of causes and contributors), and how they could be solved (how to make improvement). When additional information was required in this process, additional field observations, document reviews, or interviews were conducted and AFINs were developed based on analysis and evaluation of these facts.

AFINs including specific problem examples were explained to the counterparts with reference to the review criteria (PO&Cs) and industry best practices. Discussions were repeated until mutual understanding and recognition with respect to the nature, route cause and contributors of the problems were attained.

The details of these discussions and the feedbacks from the counterparts were presented again at the review team meeting. All of the review team made further discussion and analysis to brush up Strengths and AFINs in terms of accuracy and appropriateness from multiple aspects considering the feedbacks.

3.2 Review Scope

3.2.1 Reviewed Areas

In the review, six fundamental areas [(1) through (6)] were reviewed.

(1) Organization and Administration
(2) Operations
(3) Maintenance
(4) Engineering Support
(5) Radiological Protection
(6) Operating Experience
(7) Chemistry
(8) Training
(9) Fire Protection
(10) Emergency Preparedness

3.2.2 Review Team Members

The review team consisted of:

Managing Representative： Matsushita, Director of JANTI
Team Leader ： Naruse, Director of JANTI
Team Members ： 14 members including Naruse
(3 INPO staff members, 4 staff members from JANTI member organizations and 7 JANTI staff members)

4. Outline of the Results

The following Strengths and AFINs were identified. However, these AFINs were not the kind necessitating immediate corrective actions to ensure nuclear safety.

4.1 Strengths

Strengths identified by the review team are four items.

[Engineering Support]

(1) To proactively cope with the revision of the seismic design guidelines, the station has started engineering work to improve seismic safety margins. It is planning to complete the engineering work by FY 2010 for Unit 1 and 2 and FY 2007 for Unit 3 through 5. In particular, since the engineering work on Unit 3 through 5 is performed while the plant is operating, various

methods have been worked out and put into practice to ensure safety during plant operation.

[Operating Experience]

(2) The station has compiled the “30 Years of Engineering History” by voluntarily putting together their experience in coping with problems that occurred over the 30 years since the commercial operation of Unit 1 started (March 1976) along with new information, knowledge, and technology introduced during the same period. Efforts are being made to actively utilize this material in daily activities, rather than just keeping its value as a record. A scheme of Corrective Action Program (hereafter, CAP) has been established to discuss whether any event that occurred recently should be added to the “30 Years of Engineering History” at daily CAP meetings.

(3) The station has introduced the “Operation Management System,” which allows for trend and threshold monitoring of operating parameters imported into process computers. This system is also capable of monitoring the correlation among multiple parameters. The plant personnel themselves have been working out ways to monitor operating parameters efficiently and detect abnormal symptoms early enough.
There is an example, in which this system was utilized to detect changes in the tank water level early enough to take appropriate action.

[Organization and Administration]

(4) Comprehensive training facilities that can be used extensively by the station engineering staff to reinforce their technical understanding of major components within the station are utilized.
Specifically, mock-ups of major components have been set up in the Nuclear Training Center. The actually damaged components are exhibited in the reference room (“Gallery to Learn from Failures”) to prevent the past lessons learned from fading with time.

4.2 AFINs : Areas for improvement needed

On the other hand, 13 areas for improvement needed were identified.

[Operation]

(1) It is desirable to further clarify the roles and responsibilities shared among the shift supervisor, assistant supervisor, and operators with regard to operations in the main control room during normal operations and transient events. Ways to exchange information among operators during transient events can also be improved further.
During a surveillance test, for example, it was observed that the shift supervisor and assistant supervisor were checking the alarms and performing operations without clearly transferring

supervisory responsibility between the two supervisors.

(2) Fundamentals of plant monitoring and operational activities performed by operators can still be improved.
During a surveillance test, for example, it was observed that the operator checking a procedure was not consistently checking whether the operator was operating the right switches.

(3) Ways to conduct family training using a simulator at the Nuclear Training Center can still be improved.
For example, the instructor at the Nuclear Training Center did not review the training focusing on the behavior of the operators in training. In addition, the simulator control panel was not equipped with switch covers and operator aids used on the control panel in the main control room.

[Maintenance]

(4) It is desirable to further improve the consistency of basic steps taken in each job performed at the station.
For example, it is presumed that the event in which drainage was observed from the shaft seal part of the freshwater pump of the Unit 3 emergency diesel generator (A) in November 2006 was caused by certain parts installed the other way around during a periodic maintenance.

(5) It is desirable for supervisors of the Maintenance Department to oversight employees of contractors more effectively so as to improve the station performance.
For example, some supervisors of the Maintenance Department did not address the problems when they found immediately on the spot. Rather, they commented on them later in their reports or chose to amend the procedures and prompt the workers to change their behavior.

(6) Lifting and rigging practices, and lifting and rigging tools management can still be improved.
For example, degraded wire slings (rigging wires) were placed in the Unit 3 turbine building.

(7) It is desirable to more thoroughly communicate management expectations for appropriate procedure use when jobs are performed.
For example, it was observed some workers performed the job using a procedure without seal of station authorization.

(8) It is desirable to improve the use of personal protective equipment by plant personnel and workers so as to reduce the contributors that may lead to accidents resulting in injury or death.
When the reactor core isolation cooling system was in operation, for example, many of the plant

personnel and workers who were checking the operating status on-site were not wearing earplugs even though it was disturbingly noisy in the area surrounding the equipment.

[Engineering Support]

(9) The management of combustible materials at the plant can still be improved to ensure a high level of safety.
For example, it was observed that cardboard boxes were placed in the metal-clad switchgear room regularly used for Unit 1 and behind the control panel in the new radwaste (NRW) control room.

[Radiological Protection]

(10) Since the total exposure during outages is relatively high, it is desirable to investigate the causes, for example, benchmarking good practices in other stations so as to further reduce exposure.

(11) It is desirable to pay attention in detail to the worker's performance and temporary articles within contamination controlled areas so as to prevent contamination from spreading.
For example, it was observed that a supplemental worker touched his eyeglass with the rubber gloves with which he had touched some contaminated tools.

[Operating Experience]

(12) Both station and industry operating experience are analyzed and discussed at daily CAP meetings and monthly screening meetings, respectively. Although the results of such analyses and discussions are incorporated into work procedures, it is desirable to further utilize operating experience by, for example, informing of it prior to surveillance tests and at pre-job briefings prior to maintenance work.
During a pre-job briefing of pulling circuit breakers out, for example, past operating experience was not introduced.

[Organization and Administration]

(13) To further improve the performance of the station, it is desirable for the management to sufficiently involve in or provide oversight such major areas as operation, maintenance, and industrial safety.
For example, the management is losing the opportunity to improve performance because they are not trying to obtain useful data that can be obtained through effective field observation.