

ALARA Activities at Ohi NPP

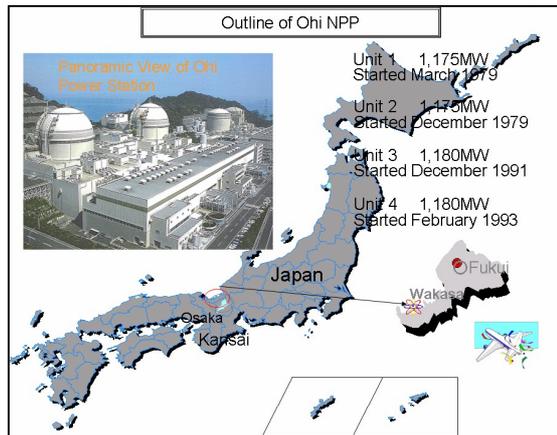
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1. Outline of Ohi Nuclear NPP

Kansai operates 11 reactors at three nuclear power plants in the Wakasa region. Ohi NPP is the biggest among them. It has four PWRs: two 1,175 MW and two 1,180 MW units, totaling 4,710 MW.

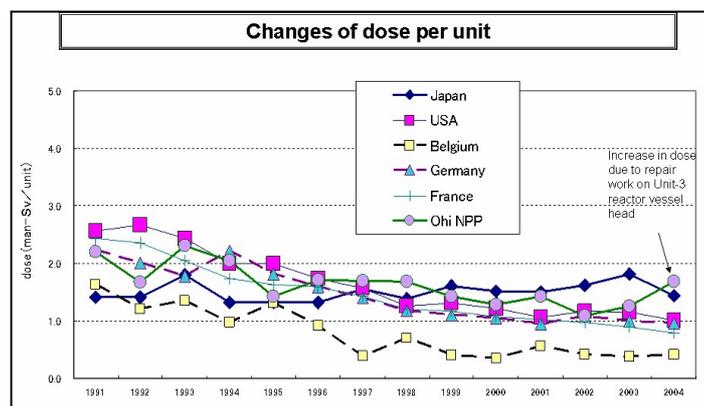


2. Dose Reduction Efforts

Ohi NPP established a vision for 2010 with an aim to be the best nuclear power plant by 2010.

Three strategies were developed, and for each strategy goals were set. One of the goals is the reduction of the dose to 1.4 man-Sv/year (three-year-average).

The dose at Ohi NPP is on the same level as the Japan's average, but has leveled off in recent years. Belgium succeeded in substantially reducing the dose. Doel NPP achieved a WANO index of top 5. Ohi decided to reduce the dose to 1.4 man-Sv/year, the same level as Doel.



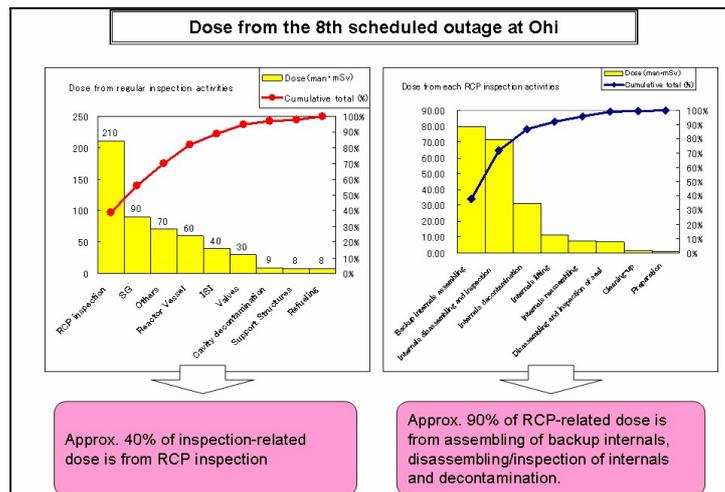
3. Analysis of Dose at Scheduled Outage Activities

An analysis of the dose of scheduled outage activities proves that about 40% of the inspection-related dose is from RCP inspection. Further analysis of the dose from RCP inspection activities shows that some 90% of the RCP-related dose is from the assembling of backup internals, disassembling and inspection of internals

as well as the decontamination of internals.

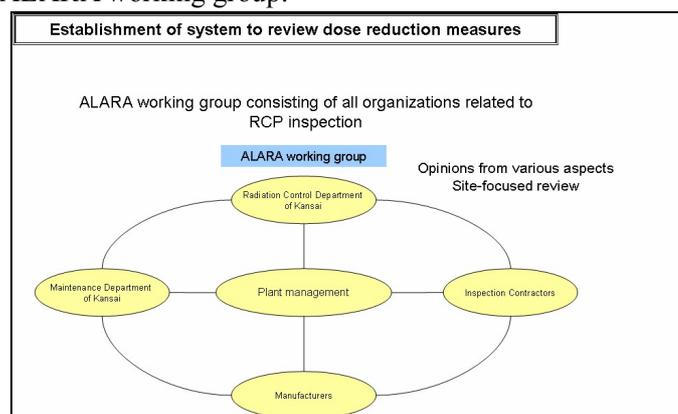
The dose from RCP disassembling and inspection at Ohi 3 and 4 is about two times higher than Japan's PWR plants' average.

Ohi NPP decided to reduce the dose from RCP inspection activities as a step toward achieving the vision for 2010.



4. Establishment of Working Group

The ALARA working group was established through the participation of the Kansai's radiation control and maintenance departments, manufacturers and inspection contractors to address the reduction of the radiation dose in RCP inspection activities. This group covers all the aspects of RCP inspection, including the designing of equipment, inspection activities and administration. A plant management member was appointed leader of the ALARA working group.



5. Development of Dose Reduction Measures

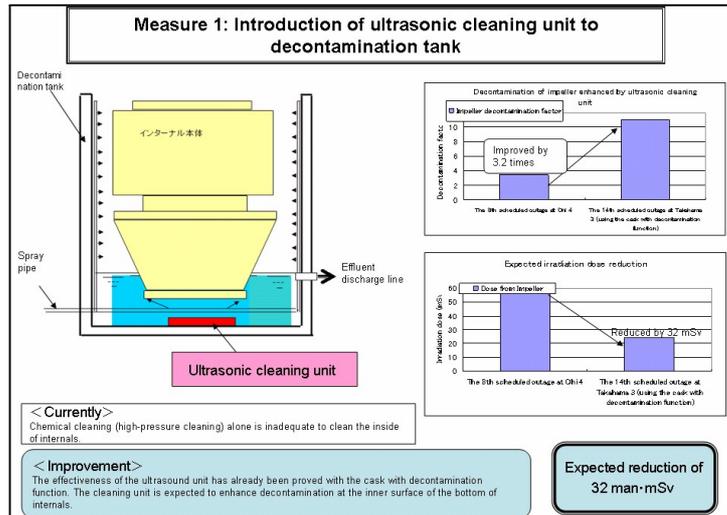
Questionnaires were sent to some 50 workers involved in RCP inspection activities to identify the causes of high doses from multiple aspects.

Based on responses, major causes were extracted using the cause and effect diagram. The major causes were further broken down to develop measures. Proposed measures were evaluated in terms of reduction effect and cost efficiency and the most effective measures were chosen.

6. Reduction Measures

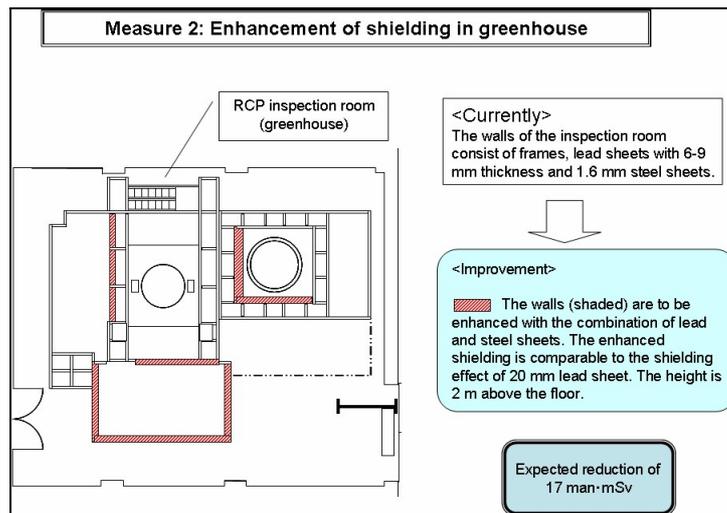
1) Introduction of Ultrasonic Cleaning Unit for Decontamination Tank

Chemical washing and high pressure water are used to decontaminate the internals. The ultrasonic cleaning unit, which has already been proved effective at another plant, is to be introduced for the decontamination tank to cost effectively enhance decontamination. This measure is expected to reduce the dose by 32 man-mSv.



2) Enhancement of Shielding in Greenhouse

Ohi NPP has a room exclusively used for RCP inspection. For shielding the walls are lined with 6 – 9 mm lead sheets and 1.6 mm steel sheets, but it is barely adequate. The walls near the pass way will be enhanced to the degree that they have the same shielding effect as 20 mm lead sheets. This enhancement is expected to reduce the dose by 17 man-mSv.

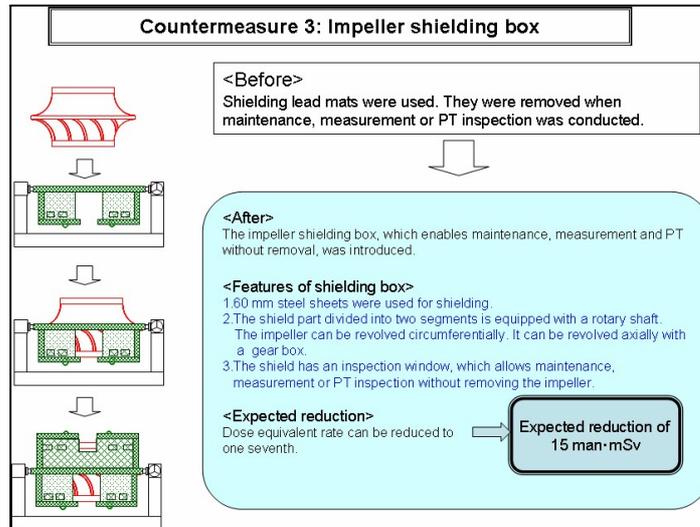


3) Impeller Shielding Box

The impeller, one of the most contaminated parts, requires the longest time for inspection. Lead mats are applied to the impeller for shielding. When inspection is conducted, a lead mat applied to the inspected part is removed. This operation is time consuming and undercuts the effect of shielding.

The impeller box has been developed to enhance shielding. The shielding box has a window, which facilitates inspection and maintenance. This improvement is expected to reduce the dose by 15 man-mSv. The impeller shielding box is the result of a trial and error process by Ohi NPP in cooperation with

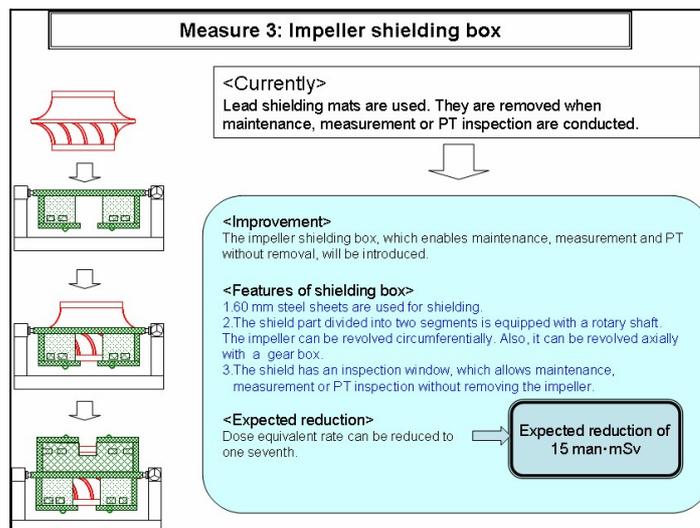
inspection workers.



4) Improvement of Internals Hoisting Device

When handling the internals, fine focusing is difficult. Attaching and removing the hoisting device and internals takes substantial time. Workers have to operate close to the sides of the high dose internals when installing and removing the hoisting device.

The proposed improvement of the hoisting device will enable workers to operate only at the upper part of the internals, where the dose is low. This modification is expected to reduce 9 man·mSv by saving workers and working hours. This improvement was also developed by Ohi NPP together with site workers.



5) Introduction of Electric Tool

In removing the impeller from the rotor, a special tool needs to be fixed on the impeller with bolts, and this operation is manually conducted. It takes significant time. Automatic tools exclusively used for this operation were purchased. They are expected to save working time and reduce 3 man·mSv.

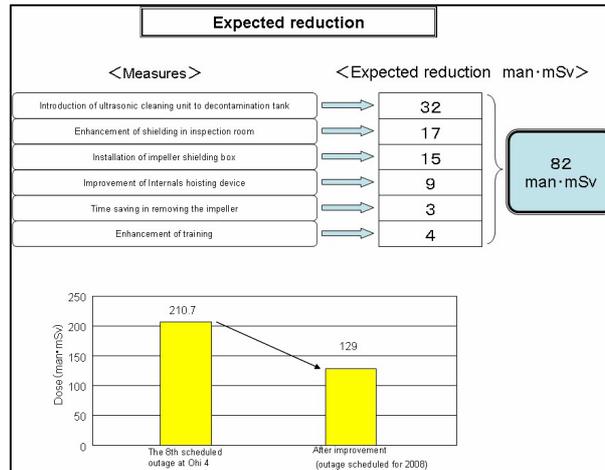
6) Enhancement of Training.

Training is provided for less experienced workers. Classroom instruction can give only limited knowledge and so on-the-job training is emphasized. A video was developed to demonstrate how to perform inspections to supplement classroom instruction.

6. Expected Reduction

The evaluation of the proposed measures has not been made yet, because the measures are scheduled to be introduced in 2008. A total of 82 man·mSv is expected to be reduced by the improvement measures.

After the application of the measures, the effect will be validated, and further reduction efforts will be made through the PDCA cycle.



7. Summary

Multiple aspects of dose reduction possibilities were discussed through the participation of all the people involved in RCP inspection activities including Kansai's radiation control department, maintenance department, manufacturers as well as site workers under the leadership of the plant management. Through discussions all the participants shared a common objective---the reduction of dose.

The management and workers worked together to develop measures through trial and error processes. The efforts resulted in effective measures that met the needs of workers on site.

The current program focuses on the inspection of RCP. Ohi NPP is continuously committed to dose reduction and reduction efforts will be expanded to other inspection activities.