Dose Reduction Measures at Shika Nuclear Power Station Unit-1

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Location of Shika NPP

Nuclear Power Plants in Japan

Tokyo Electric Power Co.--Kashiwazaki Kariwa
The Japan Atomic Power Co.--Tsuruga
The Kansai Electric Power Co.--Mihama
The Kansai Electric Power Co.--Ohi
The Kansai Electric Power Co.--Takahama
The Chugoku Electric Power Co.--Shimane
The Chugoku Electric Power Co.--Kaminoseki
Kyushu Electric Power Co.--Sendai

Electric Power Development Co.--Ohma
(Commercial plants, as of Aug. 2002)

Hokuriku Electric Power Co.--Shika

Tohoku Electric Power Co.--Higashidori
Tohoku Electric Power Co.--Maki

Tokyo Electric Power Co.--Fukushima Daiichi
Tokyo Electric Power Co.--Fukushima Daini

The Japan Atomic Power Co.--Tokai
Closed (Mar.1998)

The Japan Atomic Power Co.--Tokai Daini

Chubu Electric Power Co.--Hamaoka

Shikoku Electric Power Co.--Ikata

Output scale

Operating
Under construction
Preparing for construction

Number of Units
Total Output (MW)

Operational 52 45,742
Under construction 3 3,838
Preparing for construction 8 10,315
Total 63 59,995
### Major Specification of Shika Unit-1&2

<table>
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<tr>
<th></th>
<th>Shika Unit-1</th>
<th>Shika Unit-2</th>
</tr>
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<tbody>
<tr>
<td><strong>Commercial operation</strong></td>
<td>July 1993</td>
<td>March 2006(Plan)</td>
</tr>
<tr>
<td><strong>Reactor type</strong></td>
<td>BWR5</td>
<td>ABWR</td>
</tr>
<tr>
<td><strong>Electric power</strong></td>
<td>540MW</td>
<td>1358MW</td>
</tr>
<tr>
<td><strong>Condensate polishing system</strong></td>
<td>hollow fiber filter + demineralizer</td>
<td>hollow fiber filter + demineralizer</td>
</tr>
<tr>
<td><strong>RWCU flow rate</strong></td>
<td>64t/h (2% of feed-water flow rate)</td>
<td>154t/h</td>
</tr>
</tbody>
</table>
**Dose reduction measures on design and construction stage**

<table>
<thead>
<tr>
<th>Improvement of the procedures of work</th>
<th>Automatic or remote system</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Automatic equipment for In Service Inspection</td>
</tr>
<tr>
<td></td>
<td>Automatic machine for CRD replacement</td>
</tr>
<tr>
<td></td>
<td>Automatic decontamination machine for reactor well</td>
</tr>
</tbody>
</table>

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<tr>
<th>Improvement of the environment of the work field</th>
<th>Reduction of corrosion product</th>
<th>Use of materials with low-cobalt content</th>
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<tr>
<td></td>
<td>Reinforcement of shielding</td>
<td>Dual Condensate polishing system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oxygen injection into the feed-water system</td>
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<tr>
<td></td>
<td></td>
<td>Shielding of PLR piping</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shielding of high radiation rate piping</td>
</tr>
</tbody>
</table>

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Measures for reducing corrosion product in Shika unit 1
The Systematic approach to dose reduction of each work
(PDCA cycle)

- Planning the dose reduction measures for each work
- Confirming the effect of measures
- Mentioning the measures in manuals
- Radiation control during the work
Dose reduction measures on operation stage

- temporary shielding
- minimizing the drainage range

- securing the distance between source and working area
- preventing the thoughtless access to source

- shortening the work time by mock-up
- control the work time

- Chemical decontamination
- RHR low temperature shutdown cooling operation

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Collective Dose of Plant Outage at Shika Unit-1

- Weld line crack check of PLR piping
- Partial replacement of PLR piping
- The inspection of PLR pump & valves

Collective dose (man/Sv)

Plant outage

1st 2nd 3rd 4th 5th 6th 7th 8th 9th
The result of 8th outage Chemical decontamination
Results of Chemical Decontamination (example of EL.6260)

Before Decon.                      After Decon.

4th outage
PLR(A)

5th outage
PLR(B)
The results of chemical decontamination of PLR piping

<table>
<thead>
<tr>
<th>Outage</th>
<th>Dose Reduction (calculated)</th>
<th>Work</th>
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<tr>
<td>4th</td>
<td>ेरेन् स्वास्थ्य</td>
<td>• The inspection of PLR pump(B) &amp; valves</td>
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| 8th    | ेरेन् स्वास्थ्य | • Weld line crack check of PLR piping  
• Partial replacement of PLR pipes |
Co-60 deposition on PLR piping with decontamination
RHR low temperature shut down cooling operation

Past SHC

LT-SHC

Start of reducing pressure op.

Past shutdown cooling
Low temperature shutdown cooling

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Radioactivity deposition on RHR piping during shutdown cooling

shutdown cooling start temperature