“Measures for Reduction of Radiation Exposure at Higashidori Nuclear Power Station“
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This is a presentation concerning measures for exposure reduction of the Higashidori Nuclear Power Station of the Tohoku Electric Power where the total exposed dose of the operators at the time of its 1st periodical inspection achieved the low dosage of 0.14 man-Sv. It mainly focused on the role of water chemistry.

The Higashidori Nuclear Power Station implements *clean plant activities* as a crud reduction measure, *extremely low iron-high nickel operation* as water quality control and dose rate reduction measures, such as oxidation treatment to the heat exchanger tube of feedwater heater—the first among actual plants—as material surface treatment. Among the radiation sources which affect the operator exposure of nuclear power stations are exchangeable radiation sources and deposited radiation sources. While clean plant activities are mainly focused on reducing crud which acts as a deposited radiation source, water quality control aims at the suppression of exchangeable radiation sources.

The clean plant activities enhance the crud reduction effect by providing suitable measures in accordance with respective stages, such as system test, start-up test and output operation, as is exemplified by the implementation of cleanup operation at the time of start-up test.

On the other hand, water quality control keeps the amount of the iron crud carried in from feedwater to nuclear reactor at a low level by adopting extremely low iron-high nickel operation, and it creates a high nickel condition inside the furnace. This nickel is used to form a dense oxide film on the surface of the piping outside the furnace, suppressing adhesion to the inside of the film. Iron crud concentration in the feedwater is maintained at 0.1 ppb or less. Although nickel concentration was a little lower at the beginning, the level of several ppb has been maintained since the second cycle, leaving the inside of the furnace in a high nickel condition.

As a problem of plants that performed commercial operations in recent years, the phenomenon where Cr ions in the reactor water increase remarkably can be observed. Since the carried-in Cr ions turn the furnace environment into an oxidizing atmosphere, there is a concern that they may promote the elution of the radioactive and corrosive products (Co-60) which have been stably taken in into the oxide film on the surface of fuel cladding tube, causing an increase in underwater radioactive concentration as a result. The main source of release of Cr ions is the heat exchanger tube of the feedwater

heater, and in the Higashidori Nuclear Power Station, the heat exchanger tube of the second feedwater heater which was located at the end of feedwater heater was subjected to oxidation treatment for the first time among the actual units, thereby aiming at the suppression of Cr carried in from feedwater.

Due to the synergistic effect of the extremely low iron-high nickel operation and the oxidation treatment of the heat exchanger tube of feedwater heater, the suppression of the take-in of radioactive nuclides into the equipment and piping outside the reactor was aimed at, and the dose rate of the piping of reactor recirculation system which governs the dosage of containment atmosphere decreased significantly. The measurement result at the time of the first periodical inspection of the Higashidori Nuclear Power Station was 0.06 mSv/h, which was below the original target value, and it maintained a low level of 0.16 mSv/h at the time of the second periodical inspection as well.