

Integrity Inspection of Dry Storage Casks and Spent Fuels at Fukushima Daiichi Nuclear Power Station

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A safe storage of spent fuels has been considered as one of the key issues in order to ensure stable operation of nuclear power plants. At present, 54 light water reactors are in operation in Japan and the amount of spent fuels generated in this country reaches as much as 1,000ton-U every year. In order to meet our country's policy of reprocessing spent fuels, Japanese utilities have been striving for the start-up of a national reprocessing facility in Rokkasho, Aomori. When the Rokkasho reprocessing plant starts its full-power operation, it is expected to contribute to complete our country's nuclear fuel cycle. However, since the Rokkasho reprocessing facility has a capacity of 800ton-U/year, the amount of spent fuels waiting for reprocessing is considered to increase in the long term.

Under such situation, Tokyo Electric Power Company (TEPCO), which operates 17 BWR plants at three locations, is continuously trying to keep the flexibility for the storage of spent fuels. Among many measures, there are on-going projects to replace the current large spent fuel racks into those of more compact designs, construction of an on-site interim storage facility and a common spent fuel storage pool at Fukushima-Daiichi NPS. For further flexibility, TEPCO decided to build a Japanese first off-site interim storage facility at Mutsu, Aomori as a joint project with the Japan Atomic Power Company (JAPC). At present, the facility is under construction aiming at starting its operation in July 2012.

On this project, so-called dual-purpose casks are being used for the safe transportation and storage of spent fuels. According to Japanese regulations, utilities have responsibility for the safe transportation of spent fuels, while RFS, the interim storage facility's owner, is responsible for the safe storage of casks and spent fuels. Since the same cask will be used for the post-storage transportation of spent fuels after long-term storage, it is required for the utilities to predict the deterioration phenomena of spent fuels and casks during its storage period by accumulating enough experience and knowledge in storing fuels in dry conditions.

In order to meet this demand, TEPCO has been conducting integrity investigations at our on-site dry storage facility at Fukushima-Daiichi NPS where more than 400 fuel assemblies have been safely stored since 1995. In this facility, in addition to the continuous monitoring of the storage condition, special integrity investigations have been conducted almost every 5 years from the beginning of its storage. Up to now, the integrity investigations were conducted twice, in 2000 and 2005.

At both integrity investigations, both sealing performance of metal gaskets and integrity of fuel claddings were investigated cautiously. The sealing performance of the sealing parts was conducted as a combination of a visual inspection of metal gaskets and the flange seal surface and a leak-tight test. The examination of fuel claddings was composed of a visual inspection of a spent fuel and a measurement of Kr-85 gas concentration within the cask.

As a result of these series of investigations, it was verified that although some part of metal gaskets were slightly whitened due to the existence of residual water, its sealing performance were kept as expected and fuel cladding were preserved in good conditions.

Our effort to gain more knowledge about the long-term storage of spent fuels will be continued steadily. For further progress, we are planning to have periodical inspections of dry storage casks in the future too. The next inspection is going to be held within a few years and the result attained there will be reflected to the design and maintenance plan for the Mutsu project.