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Risk Assessment Strategy for Decommissioning of Fukushima Daiichi Nuclear Power Station

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Risk management of the Fukushima Daiichi Nuclear Power Station decommissioning is a great challenge. In the present study, a risk management framework has been developed for the decommissioning work. It is applied to fuel assembly retrieval from Unit 3 spent fuel pool. Whole retrieval work is divided into three phases: preparation, retrieval, and transportation and storage. First of all, the endpoint has been established and the success path has been developed. Then, possible threats that are internal/external, technical/societal/management, are identified and selected. "What can go wrong?" is a question about the failure scenario. The likelihoods and consequences for each scenario are roughly estimated. The whole decommissioning project will continue for several decades; i.e. long-term perspective is important. What should be emphasized is that we do not always have enough knowledge and experience of this kind. It is expected the decommissioning can make steady and good progress in support of the proposed risk management framework. Thus the risk assessment and management are required and the process needs to be updated in accordance with the most recent information and knowledge on the decommissioning works.

Keywords: Fukushima Daiichi Accident, Decommissioning, Spent Fuel Pool, Risk Assessment, Risk Management

I. INTRODUCTION

Decommissioning of the Fukushima Daiichi Nuclear Power Station (FD-NPS) is not a straightforward task. One needs to deal with fuel debris in containment vessels, fuel assemblies in the spent fuel pools (SFPs), the contaminated water and so on. Risk characteristics of the hazardous objects are significantly different from those in an operating nuclear power plant. Thus, understanding of the risk characteristics and assigning priorities on individual tasks are important in the decommissioning of the nuclear power plants at the FD-NPS.

It is reminded that the accident at the FD-NPS is a multi-unit event. The seismic-induced tsunami event on March 11, 2011 resulted in the reactor core melt in three units [1]. In addition, a few thousands of fuel assemblies were left in the SFPs of four units which reactor buildings were seriously damaged and contaminated by the release of radioactive materials *plan* and/or hydrogen explosion.

The risk management goal of the decommissioning project is to control and reduce the risk of the FD-NPS so that the public and workers are not exposed to significant radiation and radioactive materials are adequately confined. It is achieved by removal of the radioactive materials, in other words, by reducing the hazard potential on the site. It is noted that activities of removing or reducing the hazard potential may bring another risk of failure in operation resulting in the undesirable event. Therefore, appropriate decision making is required for every activity in the decommissioning project taking advantage of postponing activities into consideration according to circumstances. For achieving the goal, one needs to perform activities with comprehensive and overall viewpoints. We can optimize the decision making by balancing pros and cons such as the reduced risk and added risk, advantage and disadvantage, and cost and benefit.

The purpose of this study is to propose the risk management framework for the decommissioning of the FD-NPS. The risk management framework is needed to be established for adequate and appropriate risk control and decision making as well as communication with the public and other stakeholders. All the activities and possible threats including societal and management aspects have to be identified and evaluated. Accordingly, it is expected that the decommissioning process is