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Impact of radioactive waste management on dismantling cost

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Abstract: It is important to estimate the cost of decommissioning at various stages of planning to manage decommissioning projects efficiently. Uncertainties regarding radioactive waste management including the availability of disposal facilities are making the estimate challenging. Some of the uncertainties such as unit disposal cost and transportation cost directly add up to the total decommissioning cost, while other factors may also influence the overall cost by limiting how the components and structures are dismantled in order i.e. for the waste to be segregated properly and fit into designated containers. In this study, impacts of radioactive waste management on dismantling cost was examined in order to plan decommissioning effectively while dealing with these uncertainties. Assuming a case of dismantling a reactor building of a 1100 MW BWR facility, labor cost and the amount of waste in each waste category were estimated for several cases with different waste container sizes. Other factors that may affect the dismantling cost are also examined including the timing when disposal facilities become available, i.e. duration of the storage of the dismantled waste before disposed.

1. INTRODUCTION A number of commercial nuclear power plants in Japan are approaching the end of their designed plant lives, and decommissioning of these facilities are expected to be major tasks in the next decades to come. It is necessary to estimate the cost of decommissioning at various stages of planning to manage these projects efficiently. Radioactive waste management cost, which constitutes a substantial portion of the total decommissioning cost, contains significant uncertainties including the timing when disposal facilities become available, unit disposal cost, distance from the decommissioning facilities to disposal facilities, mode of transport, and other specifics such as sizes and shapes of waste containers and the radiation dose limit of the waste container. Some of these factors such as unit disposal cost and transportation cost directly add up to the total decommissioning cost, while other factors may also influence the overall cost by limiting how the components and structures are dismantled in order i.e. for the waste to be segregated properly. In this study, impacts of radioactive waste management on dismantling cost was examined in order to plan decommissioning effectively while dealing with these uncertainties.
2. METHDOS Assuming a case of dismantling a reactor building of a 1100 MW BWR facility, labor cost and the amount of waste generated from dismantling were estimated using a similar method as in Smith et al. [1]. The low level waste generated from decommissioning is to be segregated into four categories according to the Japanese regulations; relatively high level (L1), low level (L2), very low level (L3) radioactive waste, and non-radioactive waste. Dismantling of reactor vessel and internals is a major process in decommissioning, and produces L1 and L2 level waste. Labor cost for cutting reactor vessel and internals was estimated to compare several cases that use different radioactive waste containers including 200 L drums, 400 L drums, and 1.6 m-cubed box. Reactor vessel and internals are first cut into a length packageable to containers, and then further cut up into smaller pieces so that each piece fits in the container.
3. RESULTS Total cutting length decreases when larger size containers are used, resulting in a decrease in the labor cost. Our estimate shows that by increasing the size of the L2 level waste from 200 L drums to 400 L drums, labor cost for cutting was estimated to decrease by approximately 30 %, and further increasing the size to 1.6 m cubed boxes reduced the estimated labor cost for cutting to approximately 50 % of the cost when 200 L drums were used.
4. CONCLUSIONS The result suggests that the size of the radioactive waste container is one of the factor that may influence the dismantling cost. Other factors that may affect the dismantling cost are also considered including the timing when disposal facilities become available, i.e. duration of the storage of the dismantled waste before disposed.

REFERENCES

[1] SMITH, R.I., et al., Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station, NUREG/CR-6174, (1996) .

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