

Logistical Optimization of Nuclear Waste Flows during Decommissioning

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Abstract : An important number of technological equipment and high-skilled workers over long periods of time have to be mobilized during nuclear decommissioning processes. The related operations generate complex flows of waste and high inventory levels, associated to information flows of heterogeneous types. Taking into account that more than 10 decommissioning operations are on-going in France and about 50 are expected toward 2025: A big challenge is addressed today. The management of decommissioning and dismantling of nuclear installations represents an important part of the nuclear-based energy lifecycle, since it has an environmental impact as well as an important influence on the electricity cost and therefore the price for end-users. Bringing new technologies and new solutions into decommissioning methodologies is thus mandatory to improve the quality, cost and delay efficiency of these operations. The purpose of our project is to improve decommissioning management efficiency by developing a decision-support framework dedicated to plan nuclear facility decommissioning operations and to optimize waste evacuation by means of a logistic approach. The target is to create an easy-to-handle tool capable of i) predicting waste flows and proposing the best decommissioning logistics scenario and ii) managing information during all the steps of the process and following the progress: planning, resources, delays, authorizations, saturation zones, waste volume, etc. In this article we present our results from waste nuclear flows simulation during decommissioning process, including discrete-event simulation supported by FLEXSIM 3-D software. This approach was successfully tested and our works confirms its ability to improve this type of industrial process by identifying the critical points of the chain and optimizing it by identifying improvement actions. This type of simulation, executed before the start of the process operations on the basis of a first conception, allow 'what-if' process evaluation and help to ensure quality of the process in an uncertain context. The simulation of nuclear waste flows before evacuation from the site will help reducing the cost and duration of the decommissioning process by optimizing the planning and the use of resources, transitional storage and expensive radioactive waste containers. Additional benefits are expected for the governance system of the waste evacuation since it will enable a shared responsibility of the waste flows.

Keywords : nuclear decommissioning, logistical optimization, decision-support framework, waste management

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