Session V: Management of Radioactive Waste and Damaged Fuel

Session V-A: Generation and Management of Materials and Waste

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Mitigation of the Chernobyl accident consequences stressed the attention on the huge volumes and the variety of wastes resulting from the accident (almost all long-lived and alfa containing radioactive waste). The accident and the mitigation of the consequences clearly demonstrated the level of unpreparedness for such accident, the absence of experience in the management of huge amounts of contaminated materials, as well as the lack of storage /disposal capacity. This resulted in a "not organized storage for not organized waste". Hence, large amounts of contaminated materials are being stored under conditions that do not fully comply with present international safety requirements.
During mitigation and clean-up operations after the Chernobyl accident, disposal facilities were constructed. Some of them are located in areas with high water table and hence (potentially) result in contamination of groundwater. For this reason some of them will require re-disposal, requiring itself a comprehensive safety assessment.
On the other hand, the Chernobyl accident resulted, during the early phase of the accident, in the creation of a special governmental "brainstorming" commission on the decision making process, with a clear allocation of responsibilities and with full power. Later on, considered options for the management of different "Chernobyl" waste types (solid, liquid, fuel, ..) were provided in the National Policy and Strategy. Attention was drawn to the fact that pre-operational work is a time and cost consuming process. Up to now there is no decision on geological disposal.
The development of facilities on the "Vector site" in the exclusion zone of Chernobyl is going on. The Vector operation covers retrieval operation of radioactive waste, characterization activities, processing activities, transport and storage/disposal of the radioactive waste in the exclusion zone. National legislation does not take into account the peculiarity of the "Chernobyl" waste and the disposal of such waste and might be considered constraining action to solve the problem.

One could question whether there are similarities with the remediation activities at legacy waste sites such as the Wismut site in Germany. The remediation goals there were multiple and mainly dealt with ensuring public safety, enabling future land use, and minimization of radiation risk. Different waste categories were considered. Waste criteria were developed as well as criteria for release of areas for unrestricted use. Success resulted from the use of a top-down approach and a step-by-step implementation. The design of storage /disposal facilities was based on an environmental impact assessment and a cost-to-benefit optimization. Other Wismut success factors were the use of BAT, the investment in robust technology for ensuring sustainability, the application of strict on-site QA/QC measures, stakeholder involvement, political motivation and an immediate and stable funding throughout the remediation project. The main difference with remediation activities such as that for Chernobyl consists of the fact that the latter event requires an immediate preparedness and action and that technologies to be used are not comparable in

view of the resulting "accident" environment. However lessons are to be learned from both sides, especially in the context of the post-accident management.

Through the effective use of the robust and structured CERCLA decision making process (with involvement of external regulators and public) for developing on-site disposal cells, the USDOE-EM developed disposal capacity for large amounts of radioactive and radioactive mixed waste resulting from remediation efforts. Nine criteria are used to provide a structured framework for decision making. USDOE-EM considers on-site disposal as the preferred option for disposal. Stakeholder confidence (trust) is gained by demonstration of a physical model and graphical visualization, external reviews, development of waste acceptance criteria and though routine public briefings.
Radioactive mixed waste is disposed of in clean-up disposal facilities designed consistent with the requirements for hazardous waste disposal. USDOE-EM requirements ("maintenance requirement") require annual reviews to confirm the continued safety of the disposal facilities. The CERCLA process has similarities with the safety case approach (safety strategy, concept, safety assessment).

Can we prepare for the unexpected (accident) and plan precautionary actions well in advance? Disastrous events such as Chernobyl or Fukushima disturb completely an orderly established system (licensing, waste management, responsibilities). Such events are characterized by many uncertainties and problems to be solved in phases. The first phase implies activities to mitigate the accident consequences and less attention is paid to waste management. Regulating the unexpected is impossible due to the unknown type and extent of the accident as well as to the associated uncertainties. Regulatory challenges to be addressed are the clear allocation of responsibilities of authorities and operators, the identification of a leading organization and a short term licensing process.

Appropriate waste management strategies should be developed, taking into consideration past accident experiences and decommissioning activities of nuclear facilities and giving due attention to interdependencies between all waste management steps and including reuse and recycling of materials. The waste management strategy should clearly mention what should not be done and what should be done.
Strategic considerations and technical suggestions on remediation (clean-up) of large contaminated areas and on the management of large volumes of contaminated wastes, should be incorporated in recommendations, guidance and legal regulations, respectively, addressing in particular possible acceleration of licensing processes and the adaptation of such processes. Plans and procedures for emergency situations should be developed in advance and implemented. Targeted handling and treatment/storage of solid and liquid radioactive waste and of contaminated materials could be proposed, notwithstanding the fact that accidents are unique in character. An idea might consist of the development of mobile waste treatment installations.
It might be worthwhile to develop more guidance on how to apply the international standards for existing situations and to consider the need for flexibility in their application.