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SURPLUS FACILITIES DEACTIVATION RISK MANAGEMENT AND STRATEGY AT THE OAK RIDGE NATIONAL LABORATORY

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ABSTRACT

Deactivating surplus facilities involves inherent risks. Tactics and strategies must be explored to manage these potential liabilities through aggressive risk management. Deactivation tasks designed to reduce or eliminate risks by placing systems or facilities in safe, stable conditions are key tools in managing risk at ORNL surplus facilities. A risk based approach to deactivation priorities ensures that the greatest return is realized per dollar expended.

INTRODUCTION

At Oak Ridge National Laboratory, the mission of the facility transition program is to achieve the greatest reductions possible in risk and surveillance and maintenance (S&M) costs as rapidly as possible. This must be accomplished while maintaining the necessary safety envelope to ensure the all facilities under the program umbrella remain or are placed in a safe condition and in compliance with all local, state, federal regulations and applicable DOE orders.

To accomplish this goal with limited resources available, it is necessary to prioritize deactivation activities at various facilities so that activities creating the greatest reductions in risk and cost relative to the cost of the deactivation task are completed first. This allows the savings from the reduced S&M to be redirected to additional deactivation activities, thus accelerating the project schedule and allowing further savings to be realized sooner. Since the deactivation activities with the most "bang for the buck" are not necessarily located in the same facility, deactivation of new facilities may be initiated before the deactivation of others in which deactivation is already underway, has been completed.

This Oak Ridge approach better addresses potential near and long term risks associated with managing multiple facilities. Rather than focusing on a systematic approach which addresses all deactivation in a concurrent fashion, the adopted approach at ORNL looks at potential risks at all facilities and approaches them in a manner that requires the movement and allocation of resources to multiple facilities. This approach contrasts with the conventional method of deactivating one facility at a time. The Oak Ridge approach is necessary for the efficient management of multiple facilities where numerous risks and liabilities may exist. In reality, all facilities in a project have to compete for project dollars. Project dollars are finite and compete with other projects and other DOE sites as well. It is believed this approach is the best way to ensure available funding is allocated to fully address the potential risks associated with the facilities falling under the wings of the project.

CASE STUDY - HIGH RANKING FACILITIES DEACTIVATION PROJECT

The High Ranking Facilities Deactivation Project (HRFDP) at ORNL provides an example of this approach at work. The HRFDP was formally initiated at the beginning of FY 1996 and had a scope that covered the deactivation of 30 plus facilities including research reactors and other various research/process facilities. Many of these facilities contained multiple risks associated with them. The most serious potential liability facing the HRFDP was the lune plates stored in an underground silo at the Tower Shielding Reactor Facility (TSF). These lune plates were spent nuclear fuel elements that were stored in a drum full of mineral oil and placed in the underground silo two decades ago. Over the years, water accumulated in the drum and displaced the oil. Without the protection of the oil, the fuel cladding corroded and began to release fission products into the drum. Had the situation been allowed to deteriorate, the drum would have eventually failed, releasing fission products into the environment. The HRFDP made the remediation of the lune plates a top priority and removed the lune plates from the silo in the Spring of 1996. The lune plates were cut up in a hot cell facility and packaged for shipment to the Savannah River Site for permanent disposition.

Although the next example is at the same facility and not a radiological associated threat, it indicates a risk based approach and not a facility by facility based approach. In this case the three instrument towers adjacent to the main TSF complex were targeted and prioritized based on an official yellow alert released by the DOE. This yellow alert indicated a potential problem with the underground anchor devices used to tie down the multiple guy wires holding the towers in place. The anchors used for the instrument towers were of the same type that was targeted in the yellow alert. Failure of any of the anchors could permit the towers to fall in an uncontrolled fashion at an unknown time in an area where various personnel were often passing or working near. In response to this potential near term risk, activities were initiated and resources allocated to dismantle the instrument towers and recycle the scrap metal, thereby eliminating a potential risk.

After the removal of the lune plates and the instrument towers at the TSF, there were numerous additional deactivation activities at TSF that needed to be completed before the facility could be turned over to the Decontamination and Decommissioning Program (D&D—EM-40), including the removal of activated scrap metal items from the boneyard, disposition of the elemental sodium inventory, and disposition of the lithium hydride inventory. However, completion of these activities would result in neither a dramatic reduction in S&M costs, nor a major risk reduction. Therefore, instead of completing the deactivation of the TSF site, the HRFDP shifted its focus to other facilities where deactivation activities would produce a greater return on investment.

The exterior paint on the High Radiation Level Analytical Facility (Building 3019B) had deteriorated badly, and was peeling off in large chunks. This paint was lead-based, as well as slightly contaminated with plutonium from an accident in 1959. A storm drain was located nearby, providing any contaminants a direct path into White Oak Creek. The roof of Building 3019B was also in poor condition. Since there were no active floor drains in the building, rainwater inleakage could flow through contaminated areas of the building and wash contamination under the door and out of the building. Contamination was also leaching out of the highly contaminated THOREX conveyer crossing the roof of the building. In the summer of 1996, the HRFDP responded to these potential liabilities by encapsulating the THOREX conveyer with silicone sealant, repairing the roof with a foam sealant, installing a new guttering system to redirect the rainwater, scraping off the flaking paint, and applying two layers of new paint to bond remaining contamination. After completion of these activities, additional deactivation work remained at Building 3019B, including converting the sprinkler system to a dry-pipe system, disconnecting and draining the process water lines, and deactivating the steam heating system. However, since these activities would result only in minor risk reduction and modest S&M cost savings, the HRFDP looked for deactivation activities with greater benefits before completing the deactivation of Building 3019B and TSF.

The water demineralizer (Building 3004) represented both an appreciable potential liability and incurred significant S&M costs. The multi-story wooden structure was in poor condition, with numerous roof leaks and peeling lead based paint. Birds entered through numerous holes in the roof, and their droppings created a biological hazard to workers in the building, as the droppings contained the histoplasmosis virus. The continued structural degradation of the building also represented a physical hazard to workers. The high utility cost required to provide freeze protection in the poorly insulated building and the high costs of the frequent repairs necessary to maintain the building represented a significant economic liability. To eliminate these problems, the HRFDP demolished Building 3004 in the summer of 1997. The above-ground portions of the building were razed, and a fresh cap of concrete was placed over the foundation slab to immobilize remaining residual contamination. The foundation slab was given back to ORNL through an MOU so that it could be used by the Lab's Plant & Equipment Division as a staging area.

After the demolition of Building 3004, the most serious potential environmental and safety hazards were eliminated. With risk and liability under control, prioritization of deactivation tasks could now emphasize cost reduction. The deactivation activity that would create the greatest reduction in S&M costs was the removal of the spent nuclear fuel from the Bulk Shielding Facility (BSF). As long as the spent fuel elements remained in the BSF Reactor Pool, great effort had to be expended to ensure that the resistivity and pH of the 130,000 gallons of water in the pool were maintained within established parameters. If the quality of the pool water were allowed to decline, the cladding on the spent fuel elements could corrode, eventually releasing fission products. After an Operational Readiness Review and numerous site preparation activities, the seventy-two spent fuel elements were shipped to the Savannah River Site in four shipments that occurred in the Spring of 1998. This activity, although very costly, freed up dollars for other activities at other facilities that had been allocated to maintain the spent fuel.

Aggressive risk management in numerous facilities is necessary to avoid the realization of these risks. This aggressive risk management approach therefore must also address "unknown risks" or those risks that have yet been identified for whatever reason. As whatever the reason, the risk still exists. Most risks are known and have been identified. Nevertheless, there is a potential for unknown risks at some facilities. This is especially true in many old research facilities. Often, these facilities lack specific documentation that describes or identifies facility systems and related activities that have been performed over the years. Many times research activities in the past were conducted under the strictest secrecy as well. This often leaves little documentation or facility knowledge. Making this even more problematic is the associated and often unavoidable loss of knowledgeable personnel that may have that specific facility knowledge.

These circumstances can lead to unknown or previously unidentified risks. The lune plates mentioned earlier were an example of a partially unknown risk. It took some time to fully identify the risks. Although the existence of these lune plates was known, they were not initially recognized as a potential problem. Only after aggressive implementation of a plan to characterize risks that analytical results were obtained from samples drawn from the oil and water in the silo drum confirming the presence of fission products, was the potential realized and addressed.

Another example of an unknown risk involved the ventilation ductwork in Building 3019B. HRFDP risk reduction strategies and activities led to the discovery of perchlorates in the ductwork of the 3019B facility. Perchlorate salts can present either a shock sensitive explosion or a deflagration hazard in sufficient quantities. In this case there was no historic data or information that would have suggested the presence of perchlorates. Additionally, the knowledgeable personnel associated with this facility were not aware of any past perchlorate use in the facility.

The discovery of the perchlorates was initiated through an aggressive approach to risk management. In this case, it was suspected that the ventilation ductwork may have been deteriorating from the inside out. There were some outward signs of oxidation of the ductwork metal and there was concern that this oxidation had begun on the inside and was only now showing outward signs. To determine the extent of the oxidation, HRFDP management allocated resources to address this potential risk. In response the ductwork was opened and a small radio controlled mobile mechanical robot with a video camera mounted was inserted into the ductwork to ascertain the extent of the expected deterioration. However, what the video examination quickly identified was a series of unknown "sand dune" like deposits of fine particulate matter on the inside of the ventilation duct. This discovery led to the next step in which a sample of the deposit material was taken for full analysis. Laboratory analysis indicated the presence of perchlorates in this material. No evidence of the suspect deterioration of the duct work was ever found which eliminated that potential unknown risk. But only through this process were the perchlorates discovered.

The presence of the perchlorates in the ductwork in Building 3019B is an example of a risk that is best managed by not performing remediation immediately. Since Building 3019B was an inactive facility with no on-going operations that could potentially disrupt the perchlorates and the relatively low concentrations found, the probability of the detonation of the perchlorates was minimal. Building 3019B is unoccupied and the potential for an explosion was very low. However, opening the duct up and cleaning out the perchlorates would involve significant risks, since the perchlorates would be disturbed during the process and personnel performing the decontamination activities would be in close proximity to the ductwork. For these reasons, removal of the perchlorates would have been a questionable and debatable risk management technique. This is especially true when the necessary resource allocations are added into the equation. A tremendous amount of scarce and as yet unavailable resources would be required to mitigate this risk entirely. However, in the long term, this risk can be safely managed and eventually be eliminated more cost effectively as facility dismantlement is initiated.

MOVING INTO THE 21ST CENTURY

To improve safety and aid in the management of risk, the Integrated Safety Management System (ISMS) has been implemented by Bechtel Jacobs Company, the prime contractor for the Oak Ridge environmental management M&I contract. ISMS is a five step process that addresses all aspects of hazards and safety issues prior to and during work. This process is followed by all subcontractors as well. The process enhances a project managers' ability to apply the Oak Ridge approach for risk management. Previously, prioritization of deactivation tasks was challenging as many of the risks at surplus facilities were hidden or not clearly understood. Today, such hazards will be more readily identified during the activity hazard assessments and job hazard analyses completed with worker involvement. The feedback loop established in the process will ensure that such identified hazards will be communicated to project managers, giving them the information and tools needed to conduct an effective risk based prioritization scheme for deactivation activities.

This process will aid in identifying many job related risks. It cannot and should not be seen as a panacea for controlling risks. It is a tool in an arsenal of tools used by decision makers to manage risks. It is an important tool but cannot replace the human factor in decision making. Although sometime fallible, the decision maker/manager is the most essential piece of the puzzle in controlling risks.

As we move into the new millennium, the DOE will be faced with many challenges in the management of aging DOE surplus facilities. The challenges are many but awareness of the challenges exists. There are numerous functions within the DOE responding to these challenges. Nevertheless, one of the greatest challenges will be to organize the necessary resources and develop a comprehensive long term integrated plan that is able to address the challenges on a more permanent and provide a firm framework in which work to mitigate risks can proceed.

Managing risks is inherently, in itself, an implication of more risk. The art of managing risks presents its own set of risks. Nevertheless, the aggressive management is necessary to ensure an adequate safety and health envelope is maintained at all aging surplus facilities. Simply diverting more dollars won't provide the fix that may be intended. Funding is a necessary ingredient but not always the most important ingredient. The most important ingredients are the generation, organizing and implementing new ideas.

Risk management can either be approached in a planned systematic manner or responded to in a defensive fire drill fashion requiring the immediate movement of resources to alleviate the problems. This reactive approach is antithetical to a proactive approach. The reactive, defensive approach is not without some merit. Nevertheless, reactivity and the pressures it can create can prompt decision makers to make the wrong decisions made under the guise of "right reasoning". In the long term, a proactive, offensive approach to risk management and risk reduction will be required to address associated risks and aging surplus facilities in a safe and effective manner.

CONCLUSION

As resources are re-allocated, this approach to risk management may lose some inherent efficiencies gained in a systematic facility by facility approach. However, that loss is minimal and often overshadowed by the efficiencies that may be gained in a risk based approach. Those personnel associated with the project become more familiar with all facilities and gain valuable experience in managing risks at various facilities. This approach also helps to uncover unknown risks, since attention is paid to each facility early in the lifecycle of the project.

With all known risks identified and addressed, the project can proceed to complete remaining deactivation activities at all facilities. Of the remaining deactivation activities at the HRFDP facilities, the one that will result in the greatest S&M cost reduction is the deactivation of the BSF pool. The activated items remaining in the pool will be removed and packaged for disposal. The pool will be drained and filled with a soft grout, thus eliminating the need to maintain the quality of the pool water and permit downgrading of the facility authorization basis documentation. In keeping with the Oak Ridge approach to prioritizing deactivation activities, the BSF pool deactivation will be the next major HRFDP deactivation activity completed.

In summary, the Oak Ridge approach to deactivation is to prioritize deactivation activities based on the amount of S&M cost and risk reduction achievable relative to the cost of performing the deactivation activity while systematically identifying and addressing associated risks. Funding is therefore a key component that must always be added into the equation. Getting the most risk reduction and S&M cost reductions out of the dollars allocated and spent is the ultimate goal. However, reducing and/or eliminating risk must be the first priority in realizing that goal. Risks always have to be prioritized and re-prioritized based on existing and new information as well as available funding. Nevertheless, prioritizing activities at various facilities concurrently is often difficult and the less data/information available, the more difficult decision making relative to activity prioritization will become.

Often times, as new facilities are added into the surplus facility deactivation program, it is necessary to aggressively identify and manage the inherited risks before full deactivation work can begin in ernest. The discovery of the perchlorates was an example of aggressive risk management. The discovery was a direct result of the HRFDP strategy to manage multiple facilities. Nevertheless, it is also an indicator that more needs to be done to identify risks and transfer the "knowledge" of the facility as well as the facility itself as they are accepted into the program/projects. Nevertheless, it also suggests that only through complete deactivation and facility dismantlement will all risks be identified and addressed.