

Identification and Prioritization of High Risk Deteriorating Support Infrastructure – 15475

David Bender *, Hai Nguyen **

* US DOE

** Savannah River Nuclear Solutions, LLC

ABSTRACT

Identification and prioritization for the recapitalization of deteriorating waste processing and storage support infrastructure and information technology (IT) is essential for a safe, cost effective, and sustainable waste management program. Funding restraints have limited programs to performing only maintenance on aging infrastructure support systems whose operational costs, technological obsolescence, and reliability risks continue to grow without a disciplined and balanced recapitalization program.

Savannah River Site (SRS) comprises both Department of Energy Environmental Management and NNSA missions, and includes a lab, Savannah River National Laboratory. SRS has developed a crosscutting identification and prioritization tool and process that provides integration of all Site mission support infrastructure recapitalization requirements and prioritizes into a single database that can be readily accessed for infrastructure investment decisions.

This database, referred to as the SRS Critical Integrated Infrastructure Priority List (CI IPL) captures risk data that includes impacts toward safety, regulatory compliance, mission, and cost for inclusion in its prioritization process. Further, the CI IPL provides a status of each entered project's readiness for execution that includes funding source, reliability of current cost estimate, and an out year budget profile.

The SRS CI IPL, created in 2009, was initially comprised of recapitalization projects for the Site's common infrastructure (i.e. shared roads and utilities) that supported all Site missions and activities. As mission program funding became constrained, the value for a Site wide integrated prioritization tool became more apparent and the CI IPL grew to include all Site mission and tenant activities which included safeguards and security requirements.

The SRS CI IPL has become a highly effective tool for achieving senior management situational awareness of the Site's most pressing support infrastructure and IT needs. The mission programs have used the CI IPL to prioritize and fund high risk projects within their own program budgets. This past year, the CI IPL was used as a budgeting and decision making tool to allocate funding for two common infrastructures high risk projects for the FY16 Site budget submission and has received laudatory comments from DOE headquarters review teams.

The SRS CI IPL and its process can be a benefit to other waste management organizations by demonstrating a proven approach toward the integration of support infrastructure and IT recapitalization requirements across diverse mission and tenant boundaries. The SRS CI IPL can provide senior management with an objective decision making tool that delivers a balanced

evaluation of project requirements in terms of multiple risk criteria; safety, regulatory, mission, and cost impacts.

INTRODUCTION

SRS is a 310 square mile (803 square kilometers) complex with over 11,000 employees executing a diverse mix of federal missions, multiple contractors with independent funding sources, and over 2,300 facilities being supported by an aging infrastructure 60 years old in some systems. SRS was established in 1950 and was previously home to six towns and 6,000 people who had to relocate. Construction began February 1951 and an infrastructure was put in place to support five reactors, two chemical separations plants, a heavy water extraction plant, nuclear fuel and target fabrication facility and Waste management facilities with over 38,000 workers at its peak. In 2003, SRS was considered a closure site with limited investments in site infrastructure systems. Over the past 10 years, funding for infrastructure sustainment declined considerably as budget constraints increased and funds were needed to support direct mission activities. As a result, cannibalization of parts and often costly piecemeal maintenance has been performed in order to maintain operations of many facilities, equipment and systems. This approach has caused an excessive, expensive and wasteful utilization of resources and increased the cost of future capital infrastructure investment.

Projections ten years ago for the completion of DOE Waste Management and Treatment programs have given way to a new reality that these programs will extend well beyond 2030 and government liability into the 2060's. Instead of following the unstated "run to failure" model of only essential preventive and corrective maintenance, DOE Environmental Management (EM) decision makers now have to consider a long term sustainable approach toward maintaining modern and capable infrastructure that will require recapitalization in order to efficiently achieve EM's waste treatment program objectives. In addition, faced with an ever increasing infrastructure deferred maintenance backlog that is measured in the billions of dollars, EM and EM Site Leadership require an infrastructure prioritization decision making tool that provides the means to most effectively choose where scarce mission dollars will be spent to realize current and long term mission requirements.

To address these funding prioritization issues, SRS developed and implemented the Critical Integrated Infrastructure Priority List (CI IPL) process as part of an infrastructure investment decision making process that captures scope, schedule, cost, risk, and other information on proposed infrastructure projects/needs that are identified and ranked as critical site infrastructure. The CI IPL leverages the site workforce and facilities by the integration of the various site organizations under one team voice.

DESCRIPTION

The SRS Environmental Management Cleanup Program includes the following:

- Radioactive Liquid Tank Waste Stabilization and Disposition (includes removal, treatment, storage and disposal of radioactive liquid waste stored in tanks and ultimately, tank closure)

WM2015 Conference, March 15 – 19, 2015, Phoenix, Arizona, USA

- Solid Waste Stabilization and Disposition (includes storage, treatment and disposal of legacy transuranic, low-level, mixed low-level hazardous and sanitary waste; General Plant Projects/Capital Equipment, EM Historic Preservation)
- Nuclear Materials Stabilization and Disposition (management and disposition of nuclear materials primarily in H and K Areas at SRS)
- Used (Spent) Nuclear Fuels Stabilization and Disposition (includes receipt and storage of used nuclear fuel from Atomic Energy Commission and DOE-EM activities, used nuclear fuel from the Foreign Research Reactor programs and Domestic Research Reactor; safe disposition and storage of heavy water stored in C, K and L areas at SRS)
- Soil and Water remediation and Facility D&D (included investigation/remediation of contaminated waste sites, surface water and groundwater in accordance with applicable State and Federal regulatory requirements)
- Safeguards and Security (provides protection of DOE-SR nuclear materials, production facilities, and classified matter from theft, sabotage or unauthorized control)
- Non-Closure Mission Support (support to enable DOE-SR to perform its missions and cleanup activities, community outreach, environmental compliance and regulatory integration, Department of Natural resources Program, DOE lease agreements, SRS Citizens advisory Board)

Having seen the increasing backlog of deferred maintenance across the Site's general (or common) infrastructure, SRS created the CIPL in 2009. More than a simple spreadsheet listing of potential projects, the CIPL database required program managers to provide a detailed assessment of their facilities and infrastructure system requirements to identify those aspects that were at risk of failure and predict the mission impact should failure occur. Generally, infrastructure recapitalization was necessary to effectively address the identified risk and a project would be developed and placed on the CIPL. The CIPL grew to include all aspects of Site infrastructure systems and facilities to include not just general infrastructure (common roads or utilities) but program specific infrastructure (process equipment, plant support systems, and plant equipment) as well. This inclusive Site wide view provided SRS leadership an 'integrated' approach toward making budgetary decisions that would most effectively remedy the Site's failing infrastructure needs.

The CIPL Team which is composed of facility representatives from each SRS program, Lab, and tenant organizations meets to propose and assess new projects, update cost and/or risk data for existing projects, share lessons learned, and discuss/implement improvement to the CIPL process. This team receives guidance and review by the CIPL Executive Integrated Project Team (IPT) whose membership includes all high level Site DOE and Contractors' Leadership. The CIPL Executive IPT is chartered to meet on a quarterly basis to review and approve the most recent CIPL revision, assess CIPL effectiveness, and to provide direction for improvements to the CIPL team.

Within the SRS CIPL, Infrastructure is defined as: "Facilities, including laboratories, and the associated structures, systems, and equipment that provide necessary services to support safe execution of the Site's missions, both inside and outside the limited area fences. This includes structures, systems, and components (SSCs) that enable, support, and underpin the Site's ability

to execute its multiple program missions.” Proposed CI IPL projects have a projected cost equal to or greater than \$100K.

In order to achieve prioritization of the burgeoning list of infrastructure risks to mission, the CI IPL team developed a standardized risk identification tool that categorized infrastructure risk into four weighted criteria that considers: Safety and Health, Compliance and Regulatory, Mission Support, and Cost Impacts. Each project’s priority score is realized through a detailed analysis of the risk to be remedied by the project. For each criterion, probability of occurrence and consequence are debated and agreed by the CI IPL Team. This produces an overall project risk prioritization score which systemically provides the most current draft CI IPL prioritized project list. The risk-based ranking method is consistent with the principles set forth in the DOE Good Practice Guide GPG-FM-030, Prioritization Section 3.0 "Environment, Safety, and Health Risk-Based Priority Model (RPM)". Risk-based prioritization of projects is not a method to pick one preferred option from several choices. Risk-based prioritization ranks projects based on the chance (probability) of bad things (consequences) happening, if those projects were not implemented and shows which mutually exclusive projects could reduce risk the most. A detailed discussion of the risk based tool implementation is found in the CI IPL Guidelines.

“Mitigation Strategy” is also included in the database to provide additional information to assist management to better understand how a facility is handling problems (real or potential) associated with not having funding for the project until a permanent fix is implemented; also in some cases, how systems are being “band-aided” and the critical needs for project funding.

DISCUSSION

Once the information has been captured, each item is evaluated individually for impacts and outcomes against four weighted risk-based criteria: Safety and Health, Compliance and Regulatory, Mission Support, and Cost Impacts. Each of the four categories’ severity rankings range from “Extreme Importance/Severe – Critical” to “High Importance/ Significant” to “Moderate Importance/Marginal” to “Low Importance/Negligible” to “None.” The criteria are compared using the Kepner-Tregoe (K-T) method. K-T is a quantitative comparison method in which a team of experts numerically scores criteria based on the team's judgments or assessments. Consequences are per the compliance with regulations, policies and guidelines established by DOE, OSHA, NFPA, SCDHEC, EPA, and other Federal and State agencies under which SRS is mandated to operate. The individual evaluations yield an overall project score and risk level that is used to integrate and consistently prioritize site infrastructure items for funding considerations into a single list, the CI IPL. The CI IPL also identifies the funding phase for each of the cost years listed (Engineering, Procurement, Construction, Engineering/Procurement, Procurement/Construction, and Engineering/Procurement/Construction)

Previously, EM considered construction of new facilities or support infrastructure only if it furthered EM operational missions. Existing plant and support infrastructure at many Sites has been in operation for over 60 years and was expected to remain viable just long enough to complete the EM mission. Although well maintained in the past, much of this infrastructure can no longer be safely maintained, meet mission requirements, or provide the levels of reliability necessary to support EM program operations due to increasing physical deterioration, dwindling

or nonexistent spare part supply, inability to meet modern code requirements, or lack of interface with more modern sophisticated plant equipment. Rote reliance on traditional preventive, predictive, and corrective maintenance programs must be supplemented by selective but significant recapitalization programs that modernize and even replace current aging infrastructure facilities and systems if EM Sites are to remain capable of achieving cleanup objectives. As illustrated by Carol Johnson, President of Savannah River Site's Management and Operations Contractor, Savannah River Nuclear Solutions, comments: "For infrastructure projects ideally we'd like to see somewhere around \$30 million to \$40 million per year over the next four to five years to work off what we consider to be the highest priority mission impactful infrastructure projects as well as some critical safety equipment for the site."

CONCLUSIONS

With the recent infrastructure failures at WIPP and steep increase in the amount of deferred maintenance as revealed by DOE Site condition assessment surveys, DOE Leadership can no longer assume that Site maintenance funding, previously considered a program operations cost or a Site overhead expense, will provide the safe and robust infrastructure necessary to achieve the EM mission. When commenting on EM's new found focus on deferred maintenance and infrastructure, Assistant EM Secretary Mark Whitney said, "We actually have to more explicitly consider those types of things in our budgeting process, our across the complex budgeting process. That's part of what we've been discussing as part of our longer-range budgeting and planning effort."

With EM Leadership recognizing that flat funding profiles predicted for out years, a more centralized management approach toward allocating infrastructure recapitalization funding across the EM Complex to maintain facility mission capabilities and readiness will be necessary. At the recent Weapons Complex Monitor Decision makers' Forum, Carol Johnson, President of Savannah River Site's Management and Operations Contractor, Savannah River Nuclear Solutions, commented about the lack of a separate account for Site infrastructure: "That would be a recommendation I would have to the Department, to put additional focus specifically on infrastructure."

A key aspect of information provided to SRS leadership through the CIPL database is the estimated project cost. Through CIPL Executive IPT discussions, the CIPL Team realized funding decisions often relied upon affordability. Therefore, estimated project costs required a visible measure of their certainty and a reasonable estimate of the schedule of funding required for successful execution of a project. For this reason, the CIPL team incorporated within the CIPL database for each project an "estimate class" adapted from that developed by Association for the Advancement of Cost Engineers. This marked improvement now provides the decision maker a three dimensional cost information tool that provides a measure of the projects definition (measure of executability or "shovel ready"), a project cost accuracy range consisting of 6 classes (i.e. Class 3 project cost could be 10-20% below or 10-30% above stated), and up to a 4 year project budget profile against a proposed execution schedule.

To illustrate SRS' increasing reliance on its CIPL process and its increasing role in making budgetary decisions, this past Spring each Site program was directed to separate its

WM2015 Conference, March 15 – 19, 2015, Phoenix, Arizona, USA

recapitalization projects contained on the CIPL and consider these separately from its projected operations costs of maintaining minimum safe conditions and meeting directed mission requirements and regulatory compliance when formulating the Site's FY16 budget request.

In addition to the funding decision making process, the CIPL was used recently as follows:

- Development of SRS highest priority project listing
- Input for the SRS Ten Year Site Plan
- Input for outyear budget development
- Input to the April 2014 EM-Wide Extent of Condition Review on Deferred Maintenance, specifically projects that relate to safety systems
- Input for the Federal Risk Management Plan and in Contract Performance Baseline Risk Register
- Input to WIPP Rad Release event
- Information for presentation to the Defense Nuclear Facility Safety Board site review in June 2014

Coupling risk prioritization and project affordability into an integrated project database has equipped Savannah River Site leadership with a necessary tool to make increasingly hard and complex funding decisions necessary to sustain Site infrastructure and facilities which will insure mission capability and readiness to meet waste treatment, storage, and cleanup missions that are now projected to extend well beyond 2030.