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Building Organizational Technical Capabilities: A New Approach to Address the Office of Environmental Management Cleanup Challenges in the 21st Century

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ABSTRACT

The United States Department of Energy (DOE), Office of Environmental Management (EM) is responsible for the nations nuclear weapons program legacy wastes cleanup. The EM cleanup efforts continue to progress, however the cleanup continues to be technologically complex, heavily regulated, long-term, and a high life cycle cost estimate (LCCE) effort. Over the past few years, the EM program has undergone several changes to accelerate its cleanup efforts with varying degrees of success. Several cleanup projects continued to experience schedule delays and cost growth. The schedule delays and cost growth have been attributed to several factors such as changes in technical scope, regulatory and safety considerations, inadequacy of acquisition approach and project management. This article will briefly review the background and schools of thought on strategic management and organizational change practiced in the United States over the last few decades to improve an organization's competitive edge and cost performance. The article will briefly review examples such as the change at General Electric, and the recent experience obtained from the nuclear industry, namely the long-term response to the 1986 Chernobyl accident. The long–term response to Chernobyl, though not a case of organizational change, could provide some insight in the strategic management approaches used to address people issues. The article will discuss briefly EM attempts to accelerate cleanup over the past few years, and the subsequent paradigm shift. The paradigm shift targets enhancing and/or creating organizational capabilities to achieve cost savings. To improve its ability to address the 21st century environmental cleanup challenges and achieve cost savings, EM has initiated new corporate changes to develop new and enhance existing capabilities. These new and enhanced organizational capabilities include a renewed emphasis on basics, especially technical capabilities including safety, project management, acquisition management and people. The new enhanced organizational capabilities coupled with more effective communications; oversight and decision-making processes are expected to help EM meet the 21st century challenges. This article will focus on some of the initiatives to develop and enhance organizational technical capabilities. Some of these development initiatives are a part of DOE corporate actions to respond to the Defense Nuclear Facilities Safety Board (DNFSB) recommendations 93-3 and 2004-1. Other development initiatives have been tailored to meet EM specific needs for organizational capabilities such as case studies analysis and cost estimating.

INTRODUCTION

The EM program is responsible for addressing the environmental legacy of nuclear weapons research, production, and testing and of DOE-funded nuclear energy and basic science research in the United States. These activities collectively produced large volumes of nuclear materials, spent nuclear fuel, radioactive waste, and hazardous waste. Over the past few years EM focused its environmental cleanup program by accelerating sites cleanup and sites closure. To achieve these objectives, a management approach was put into effect that emphasized contracting, site-specific closure and regulatory reform. This approach was primarily characterized by emphasis on cost. This emphasis however resulted in some losses of organizational capabilities, and several cleanup projects continued to take longer and cost more. The continued delays in cleanup schedules and associated increases in cost present major challenges to the DOE senior management that required a paradigm shift in its strategic approach for the cleanup program. To improve its ability to address the 21st century environmental cleanup challenges, EM initiated several changes in 2005 and 2006 to target enhancing existing capabilities and developing new ones to improve the organizational performance and efficiency. These new

organizational capabilities include a renewed emphasis on basics, specifically technical competencies to support adequate federal oversight. The new enhanced organizational capabilities coupled with more effective communications; oversight and decision-making processes are expected to help EM meet the 21st century challenges.

STRATEGIC MANAGEMENT AND CHANGE

Change has swept allover the USA in the last few decades of the 20th century. Change was primarily led by the emergence of stronger global competition and technological change. Change continues at present as evidenced by the disappearance of smokestack industries, emergence of new industries such as computers, telecommunications, software development, e-business and service industry. Change is also evidenced by corporations seeking new approaches such as integration, divesture, acquisitions & mergers, restructuring and outsourcing. In the early years of the 21st century, many management scholars, writers and consultants have been leaning towards leading change as compared with accepting or tolerating change. Many government agencies including the DOE followed the example of the private sector in pursuing change to improve their ability to meet their missions, increase efficiency and save cost.

Change led to the emergence and evolution of new ideas and experimentation with different models to conduct business in a more effective and competitive way. In the 1980's and early 1990's new management approaches emerged such as quality control, quality assurance, and total quality management to provide industry with a more competitive edge in the market place. Other management approaches emphasized reengineering of business systems and processes, while others emphasized technological innovations to leapfrog their competitors and gain market share. Some scholars combined these approaches. Joseph N. Kelada (1) advocated the integration of total quality management, reengineering, and technological innovations. Kelada also advocated addressing the issues of human resources including management, employees, and partners and business processes including planning, organization, and control systems to achieving more efficiency.

Over the last few decades of the 20th century, two schools of thought on change evolved (2). One school of thought emphasized the maximization of economic value for stockholders. It depends upon a top-down management approach, focuses on organizational structure, and programmatic planning. This approach known as theory E or creation of economic value has its origin in economics. Another school of thought emphasized developing of organizational capabilities. It depends upon a participative management approach, focuses on culture, and emergent planning. The latter school of thought is known as theory O or development of organizational capability, which has its origin in the behavioral sciences. Though these two schools of thought differ on the means to implement organizational change, both of them target achieving a more competitive edge and a robust financial outlook. Most of the organizational change that occurred in the USA followed one of these schools of thought or a hybrid of both with varying degrees of success. Change at General Electric under its former Chief Executive Officer Jack Welch illustrates the two schools of thought on change. In the early to mid-1980's General Electric went through downsizing, delayering, and portfolio pruning. Then in the late 1980's General Electric shifted its focus to more developmental and integrative activities, and by the 1990's it shifted to create what was called a boundaryless self-renewing organization. Another recent example comes to us from the nuclear field, and is briefly reviewed here below.

The Long-term Response to Chernobyl

The long-term response to the 1986 Chernobyl accident (3) (4) provides a recent study for the implementation of two of the management approaches of theories E and O, the top-down and participative management approaches, and emergent planning to meet new challenges.

The unprecedented nature of the Chernobyl accident and its long-term consequences has focused much attention on rehabilitation efforts. The direct and indirect costs of the accident in Belarus alone were estimated to be around $235 billion.

In the immediate aftermath of the accident, a top-down management approach was taken by the Soviet Authorities to implement the then needed emergency response and evacuation of impacted populations. The Soviet Authorities top-down approach for response management for the early phase was to some extent adequate. However by the early 1990's the national radiation protection authorities realized that their anticipated role in handing down information and solutions to the local populations was not working. The approach to rehabilitation, which includes organizing public health efforts, radiation measurement, and agricultural counter measures, did not take adequate account of the complex pattern of the fallout or the array of interdependent problems. The authorities recognized the need to engage the local populations, and as a result the local populations were allowed to participate in the radiation measurement and mapping activities. This helped the local populations gain a clearer picture of the environs, and began to reestablish confidence and build

trust. For example with the top-down approach mothers were aware that they were feeding their children contaminated milk or food but were unable to buy clean products from outside. Because of the participative management ability to focus on the level of individual families, it was possible for mothers to see tangible effects of these efforts in the form of reduced dose readings for their children. The top-down management approach in the immediate aftermath of the accident worked to implement emergency response and evacuations, however it did not work for rehabilitation. A change to a participative management was necessary to reestablish confidence, rebuild trust, and enable the rehabilitation process.

CHANGE IN EM CLEANUP PROGRAM

To a great extent change in EM over the past few years seems to have followed the first school of thought. A top-down management approach was used and major initiatives to reduce oversight on contractors, outsource EM federal jobs and cut costs was put into effect. Some existing programs that helped enhance people capabilities did not have adequate emphasis and/or funding, and some were abandoned to achieve cost savings, e.g. the EM Lessons Learned program created to collect and disseminate past EM cleanup experience to improve future efforts, was essentially abandoned.

The emphasis on cost cuts without commensurate emphasis on people and organizational capabilities resulted in lower morale, with unintended consequences. Several projects experienced schedule slippage and cost growth. A recent re-evaluation for EM (5) projected a $25 billion increase in total LCCE. It cited many reasons for cost growth, which included highly optimistic cost estimates. The Hanford Waste Treatment and Immobilization Plant (WTP), one of the largest EM projects for the cleanup of high-level waste also experienced major schedule delay and a cost growth amounting to more than double the initial baseline cost estimate. A recent review (6) listed several causes that contributed to cost growth and schedule delays. Several technical and people issues are listed among the causes contributing to cost growth and schedule delays. The technical issues include non-Newtonian flow, hydrogen generation induced by radiolysis, and seismic design criteria. The people issues include inadequate communications, which led to a diminished organizational capacity to provide rigorous and timely analyses. Perhaps with the benefit of hindsight, we note that certain themes seem to have been common between cost growth at WTP and safety lessons learned from NASA's Columbia Accident Investigation Board report (7), specifically the inadequate rigor of technical and safety analyses or the oversimplification of technical information communications to decision makers, outsourcing and impact of workforce reduction, and loss of organizational capability. This should not come as a surprise however, as decision making, to achieve safety and/or cost goals, is premised on a capable decision maker basing his or her decisions on rigorous analyses performed by knowledgeable technical subject matter experts.

Paradigm Shift in the EM Cleanup Program

A change in leadership at DOE and EM occurred in 2005. Secretary Bodman, with a background as a chemical engineer and heavy expertise in both business and government was sworn in as Secretary of Energy on February 1, 2005. Also Assistant Secretary Rispoli, with background as a civil engineer and heavy expertise in project management and cost control in both business and government was sworn in as Assistant Secretary for Environmental Management on August 10, 2005. As several projects continued to experience schedule delays and cost growth, the new leadership put new changes in motion that resulted in a paradigm shift in the cleanup program approach. *The shift targets enhancing and/or creating organizational capabilities to achieve cost savings.* The new Assistant Secretary of EM indicated his belief that an organization is no better than the people in it, and he placed a new emphasis on people and organizational capabilities.

To affect the new paradigm shift, EM abandoned its planned outsourcing effort. This however was a first and necessary step towards reestablishing confidence and building trust and morale in the EM organization. Management scholars indicate that rebuilding individual and intergroup trust is one of the important tasks for boosting morale and organizational revitalization. This was followed by several initiatives to improve communications, enhance oversight, and build and/or enhance organizational capabilities. These new organizational capabilities emphasize the basics such as leadership, technical competencies, project management, cost estimating and acquisitions. A new organizational structure at EM headquarters was put in place on May 28, 2006. Under the new organization new senior positions were created to reflect the paradigm shift at EM with emphasis on project management, acquisitions, cost control and people. Also a new office for project recovery was created to enhance EM ability for projects oversight. The emphasis on people was reflected by establishing an office of human capital led by a Deputy Assistant Secretary. As indicated above, achieving safety and cost control goals rely on a solid basis of technical capability, and accordingly EM initiatives to develop technical capabilities include some corporate actions in response to DNFSB recommendations to enhance safety of EM defense nuclear facilities.

WHERE DO WE GO FROM HERE

EM is implementing and/or considering several initiatives to create new and enhance organizational technical capabilities. These initiatives attempt to address issues such as the graying of the workforce through a focused effort to recruit interns and entry level technical staff, establishing professional technical career paths that include incentives for technical employees, and enhancing leadership and management excellence. EM also recognizes the need to keep existing organizational knowledge through succession planning, as experienced employees with needed skills and experience retire. One of EM efforts to enhance its managers leadership abilities relies on some of its former senior managers to help share their experience and knowledge to develop and hone leadership skills. Another important initiative is EM participation in a corporate DOE effort to improve technical professional career development. The study is conducted as one of DOE corrective actions in response to commitment 13 to DNFSB recommendation 2004-1. The proposed approach (see figure 1) outlines a technical career path for a recent graduate from college, possibly an intern or entry-level employee. He or she could progress in the organization from a technical staff to a technical professional. The organization offers opportunities for advancement via a dual career ladder in management as a manager/supervisor or in technical expertise as a senior technical advisor.

The approach includes formal training for a new entry-level employee or an intern in general technical base, functional area qualifications e.g. chemical processing or criticality safety, and site/office specific qualifications. An employee progresses on his or her career path through on the job skills enhancement, formal training, additional functional area training, and is encouraged to take rotational assignments at different Field/Area offices, Facilities, and headquarters to develop the breadth of expertise. Technical professionals with responsibilities for nuclear safety at defense facilities are further required to develop safety professional competencies through the DOE Technical Qualifications Program (TQP) and Senior Technical Safety Manager. (STSM) certification. Managers with responsibility for nuclear safety are required to have further qualifications such as Senior Executive Service (SES) and Nuclear Executive Leadership Training (NELT). The new EM development plans include emphasis both on leadership and technical capabilities.

Here below is a brief review for some of the programs to develop and enhance technical organizational skills.

Case Studies Analysis

This is a new EM development program. It relies on case studies developed from prior EM cleanup projects and Department of Defense projects. It primarily targets developing senior managers' skills in acquisitions and project management. However it also addresses issues of technical capability such as decision-making, nuclear safety, technology development and scale-up, impacts of technology on design and construction, cost estimating and budgeting, and organizational culture. The development program includes case studies such as the Savannah River's In Tank Precipitation Project, and Idaho's Advanced Mixed Treatment Project. As EM now places more emphasis on Lessons Learned from past experience, the assistant secretary champions this program. Development sessions were offered in March, May, July and December 2006 to enhance the leadership skills of existing senior managers. The case studies analysis is expected to be a requirement for future senior managers at EM.

Technical Qualification Program

In response to DNFSB recommendation 93-3, DOE developed a formal qualification program for its technical employees who provide management oversight or technical guidance and whose actions or decisions could impact the safe operations of DOE defense nuclear facilities. TQP was formalized by DOE order O 360.1. Furthermore, in response to DNFSB recommendation 2004-1 commitment 13, DOE committed to establishing and implementing a corporate accreditation process and plan, based on the Institute of Nuclear Operations model for its TQP. EM is considering plans to expand and enhance its participation in the TQP to beef up its technical organizational capabilities.

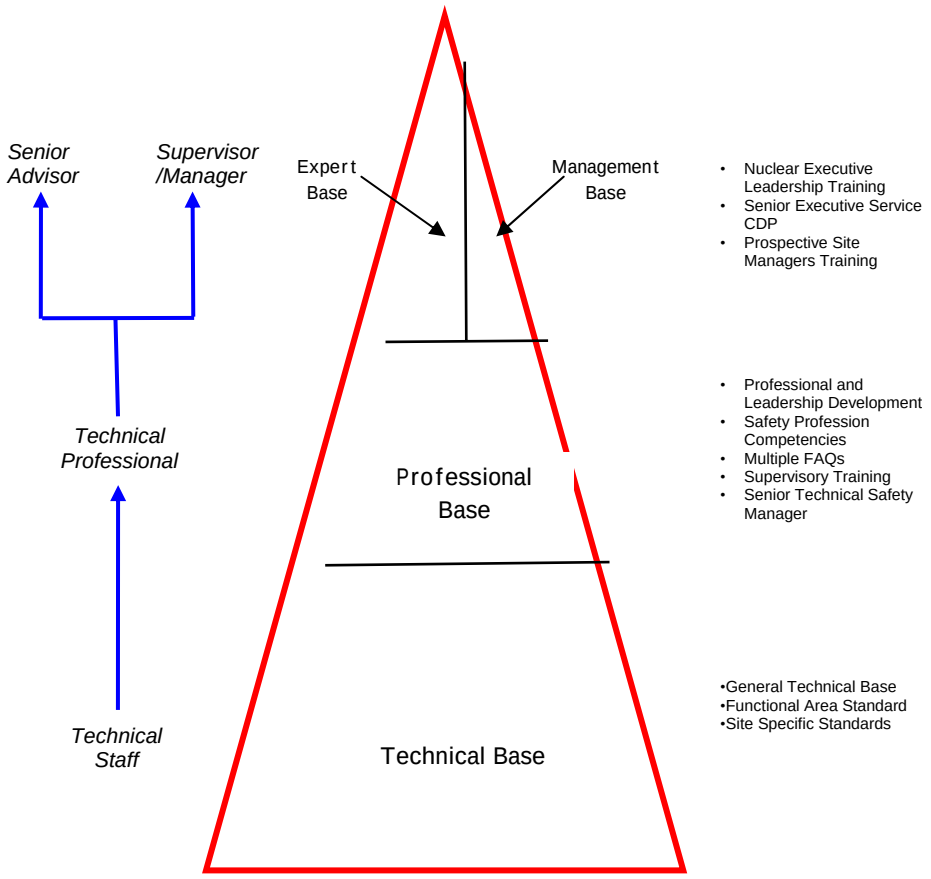

Fig.1. Outline for career development for technical employees

Senior Technical Safety Manager Qualification

In response to DNFSB 2004-1 commitment 13, DOE committed to improving its STSM program building on the facility representative qualification model. EM has developed a standing operating policy and procedure for delegation of nuclear safety authorities. The new procedure requires all managers to have STSM certification and a one-week of NELT as an eligibility requirement to receive a delegation of authority on nuclear safety. These requirements target a high level of technical competence for EM managers responsible for nuclear safety and one of the lessons learned from the Columbia accident investigation.

Nuclear Executive Leadership Training

The objective of this program is to provide a structured supplemental training to senior managers to improve their capability to fulfill safety and leadership responsibilities. The training is offered in-residence over a five-day period. Its curriculum for 2005 covered 9 training modules and included testing to verify comprehension of the material. Another NELT was held in August 2006. Also a two-day refresher NELT is also under consideration.

Cost Estimating Training

EM continued to experience cost growth in several of its projects. It has been recognized that organizational capability in cost estimating has to be developed. However as the quality of cost estimating, depends to a great extent, not only on the methodology and accuracy of the estimates, but also on the technical basis and assumptions. EM has moved to improve its technical organizational capability. EM has also initiated a new

development program on cost estimating methodologies. The new training course was held 3 times in 2006. The training was given by well- known and recognized experts in cost estimating. This new training is expected to continue to beef up EM organizational capability in cost estimating methodologies.

CONCLUSIONS

A paradigm shift has taken place at EM, which resulted in a strategic change for the environmental cleanup program. The change follows similar organizational change patterns in industry; however it attempts to address the unique nature of the environmental cleanup program; especially its need for technical expertise to deal with nuclear safety issues intrinsic in the cleanup of radioactive wastes and the design and operation of complex high hazard facilities. Over the last year or so EM has been proactively pursuing the development of new and enhanced organizational capabilities, with a renewed focus on basics. Several of the technical development programs, such as TQP, STSM, and NELT are a part of a corporate DOE response to DNFSB recommendations 93-3 and 2004-1 to improve the federal technical capability. EM has also initiated other development programs such as Case Studies Analysis and Cost Estimating to address EM specific needs. The latter two development programs target enhancing leadership, management and cost estimating capabilities. The change in EM is focusing on meeting the challenges of the 21st century and achieving EM mission and cost savings for the taxpayers.

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