Benchmarking D&D Procurement Best Practices
at
Four Commercial Nuclear Power Plants

- Oyster Creek
- Trojan
- Fort St. Vrain
- Maine Yankee

Headquarters, Office of
Procurement and Assistance Management

KAISER ◆ HILL
COMPANY

since 1827
MASON & HANGER CORPORATION

Parallax INC

Westinghouse
Savannah River Co.

October, 1998

U.S. Department of Energy
Benchmarking and Strategic Purchasing Initiatives
in partnership with
DOE/Contractor Purchasing Council

DISCLAIMER

Benchmarking

"The process of continuously comparing and measuring an organization against business leaders anywhere in the world to gain information which will help the organization take action to improve performance."

American Productivity and Quality Center

Preface:

The Department of Energy (DOE) has as two of its strategic objectives the world's largest environmental clean-up of contaminated sites and the adoption of the best management practices of the private sector to achieve business-like results efficiently and effectively.

An integral part of the strategic response to the challenges facing the Department has been the use of benchmarking and best practice management to facilitate identifying and implementing leading-edge thinking, practices, approaches, and solutions.

The DOE Federal/Contractor Purchasing Council, founded in 1995, is a unique Government-Industry Partnership dedicated to identifying and facilitating common sense business solutions. The Federal/Contractor Purchasing Council represents a fundamental redesign of the traditional "arms-length" relationship between Federal agencies and their contractors, replacing it with a more cooperative relationship focusing on joint Government-Industry ventures to remove non-value added activities, increase operational effectiveness, increase product and service quality, increase customer satisfaction, and reduce costs. The Council has undertaken a wide range of joint Government-contractor projects, which have resulted in cutting red tape, reducing costs, and improving customer satisfaction.

Foreword:

This report summarizes the benchmarking and best practices related to D&D procurement activities at four American commercial nuclear power plants.

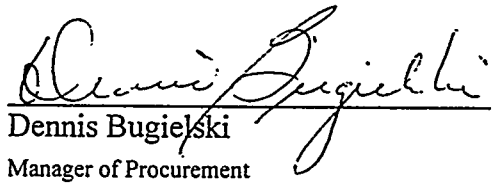
The Department of Energy (DOE) Office of Procurement and Assistance Management, in partnership with the DOE/Contractor Purchasing Council and five DOE Contractors (Kaiser-Hill Co., LLC, Mason & Hanger Corp., Westinghouse Savannah River Co., Argonne National Laboratory and Parallax, Inc.) have teamed to produce this report. This benchmarking project identified several new procurement best practices and confirmed many current practices being utilized by DOE and its Contractors.

We believe this report and the associated new D&D Procurement Best Practices homepage described in Section 3.0 of this report will provide valuable information with direct and immediate application to D&D projects in the DOE Complex.

Jim Arflin
Manager, Site Support Service Procurement
Westinghouse Savannah River Site

Gary Baker, Ph.D.
Vice President
Parallax

Brian Bidwell
Procurement Manager
Mason Hanger Corporation



Dennis Bugielski
Manager of Procurement
Argonne National Laboratory

J. Cavanagh
Manager.
Benchmarking and Strategic Purchasing Initiatives
Office of Procurement and Assistance Management
Department of Energy

Norm Sandlin
Director of Contracts
Kaiser Hill Company

For copies of this report, go to DOE Procurement Home Page at http://www.pr.doe.gov.

Acknowledgments:

Benchmarking information and preparation of this report were made possible through the concerted efforts and cooperation of many individuals and companies. We would like to specifically acknowledge the following:

Mr. James E. Hildebrand, Decommissioning Director
Oyster Creek Generating Station
Forked River, NJ

Mr. Michael E. Niehoff, General Manager
Utility Engineering
Denver, CO

Mr. Michael Lackey, General Manager
Trojan Nuclear Generating Station
Rainier, OR

Mr. Wayne Norton, Contracts Manager
Maine Yankee Generating Station
Wiscasset, ME

Contents:

List of Figures:

Definitions:

Deactivation and Decommissioning (D&D):

Deactivation: The process of placing a facility in a safe and stable condition at the conclusion of its operational life. Deactivation includes the removal of readily removable hazardous and radioactive materials to minimize the long-term surveillance and maintenance of the facility while maintaining protection of worker and public health and safety and the environment. Surveillance and maintenance are maintained at a level necessary to ensure ongoing safe and stable conditions of the deactivated facility.

Decommissioning: Those activities including surveillance and maintenance, decontamination, and/or dismantlement taken at the end of the life of a facility to retire it from service. The ultimate goal of decommissioning is unrestricted or restricted use of the site with proper regard for the health and safety of workers, and the public, and protection of the environment. The end point of decommissioning consists of the disassembly or demolition and removal of any structure, system, or component from a facility during decommissioning and the proper interim or long-term storage, or disposal of the residue from all dismantlement activities.

Decontamination: The removal of residual radioactive and hazardous materials by mechanical, chemical, or other techniques to achieve a stated objective or condition. Decontamination may occur during all phases of deactivation and decommissioning; however, the greatest decontamination activity usually occurs during decommissioning.

Dismantlement: The end-point of decommissioning consists of the disassembly or demolition and removal of any structure, systems or component from a facility residue from all dismantlement activities.

Mortgage Reduction: Costs consisting of, but not limited to, utilities, security, maintenance, surveillance, and inspections.

Surveillance and Maintenance: Cost effective periodic inspections and maintenance necessary for maintaining structures, systems, equipment and/or facilities in a safe and stable condition that is protective of the worker and public, health and safety and the environment.

Niche Subcontractor: Subcontractor providing specialty services such as river barge transportation.

Executive Summary

"The dogmas of the quiet past are inadequate for the stormy present. The occasion is piled high with difficulty, and we must rise to the occasion. As our case is new, so must we think anew and act anew." ***Abraham Lincoln***

The Department of Energy is committed to honoring the Government's obligation to clean-up sites across the country that supported the Nation's production of nuclear weapons, to dispose of spent nuclear fuel from defense and civilian nuclear power operations, and to protect human health and the environment.

Cleanup of the radioactive, chemical, and other hazardous waste left after 50 years of U.S. production of nuclear weapons is the largest environmental management program in the world, encompassing 353 projects nationwide. Current life-cycle estimates for cleanup total $155 billion. Completion of the scope of work of the program will take more than 50 years.

To reduce the monumental costs of the cleanup effort, DOE sites must seek, and find, significant opportunities to accelerate the scope of work of the cleanup. Therefore, we must explore opportunities to increase efficiency and thereby enhance performance that will enable the clean-up program to achieve its cleanup mission more quickly and at a lower cost. The Department has developed extremely ambitious goals and timetables, recognizing that significant cost saving and performance gains can be achieved through aggressive site cleanup and closure. In addition, this daunting challenge must be accomplished during a time of significant budget and resource restrictions.

It has become clear that to achieve the goals that the Department has set for itself, it could not pursue business as usual, i.e., it could do what it did in the past, and certainly not in the ways it did things in the past. The status quo was not an acceptable alternative. Consistent with this mandate for innovate thinking, there was created a unique Government-Industry Partnership dedicated to identifying and facilitating common sense business solutions. In 1994, the DOE Procurement Executive and senior executives from a wide range of DOE contractor organizations joined together to create the DOE Federal/Contractor Purchasing Council (CPC) to seek better ways of leveraging resources and knowledge.

One of the strategic tools employed by this group has been seeking best practices through benchmarking. Benchmarking can be defined as:

"The process of continuously comparing and measuring an organization against business leaders anywhere in the world to gain information, which will help the organization, take action to improve performance."

American Productivity and Quality Center

The CPC has sponsored, through its constituent members, numerous benchmarking and best practice studies, including a study of "D&D" procurement activities. For the purpose of the study, we have defined D&D as:

"**a.** ***Deactivation:*** The process of placing a facility in a safe and stable condition at the conclusion of its operational life. Deactivation includes the removal of readily removable hazardous and radioactive materials to minimize the long-

term surveillance and maintenance of the facility while maintaining protection of worker and public health and safety and the environment. Surveillance and maintenance are maintained at a level necessary to ensure ongoing safe and stable conditions of the deactivated facility; and **b.** ***Decommissioning:*** Those activities including surveillance and maintenance, decontamination, and/or dismantlement taken at the end of the life of a facility to retire it from service. The ultimate goal of decommissioning is unrestricted or restricted use of the site with proper regard for the health and safety of workers, and the public, and protection of the environment. The end point of decommissioning consists of the disassembly or demolition and removal of any structure, system, or component from a facility during decommissioning and the proper interim or long-term storage, or disposal of the residue from all dismantlement activities."

The team involved in this study was from Kaiser-Hill, LLC, Mason & Hanger Corporation, Westinghouse Savannah River Co., Argonne National Laboratory, Parallax, and DOE. The Team first had to understand in-depth the processes and performance in each of their own organizations and at their own sites. The next step was to identify those best-in-class organizations that excel at efficiently and effectively D&D operations and management. The Team members partnered with these leading-edge performers to understand why they are the best.

This report documents the team's findings and hopefully serves as a useful tool for leaders and managers at all levels of government and contractor organizations in adapting those best practices and formulas for success to governmental programs and operations, so that federal agencies and contractors can meet or exceed the best in D&D. This report focuses on benchmarking of four American commercial nuclear power plants (Oyster Creek, Trojan, Fort Saint Vrain and Maine Yankee) to identify best procurement practices being utilized to perform D&D projects.

The Objective of this report is to share with the DOE complex the accomplishments, successes and lessons learned that provide the most cost-effective commercial approaches to safe completion of D&D projects. Examples of lessons learned and best practices identified and discussed in this report include the following:

- ***Project Acceleration Saves Big Money***

  Accelerating the decommissioning project plan can save huge sums of money through mortgage reduction, personnel cost reductions, and performance of the work under known regulatory requirements at present day dollars.

- ***Innovative Contracting Models Solve Old Problems, Save Money/Time***

  Using innovative contracting models ranging from the owner as project manager over an integrated contractor team, to an owner and management contractor as an integrated team over D&D contractor(s). Four commercial contracting models are diagrammed and explained in detail in Section 2.2.2 of this report.

- ***Performance Based Incentives (PBI's) Work***

  Utilizing firm fixed price type contracts for D&D activities by developing definitive and performance-based scopes of work.

- ***Competitive Use of Prequalified Vendors***

Utilizing "best value" techniques through the use of prequalified vendors known for their capabilities and performance.

- ***Unproven technologies are risky and time consuming – Keep it simple***

  Going with proven and known technology in D&D activities and keeping it simple. In addition, allowing competition and contract structure to drive innovation.

- ***Finish Line Focus/Closure Culture***

  Creating a finish line focus and closure culture through contracting methods and performance incentives.

- ***Property Disposition***

  Using generally accepted commercial accounting practices allows disposition decisions based upon the depreciated "real" value of property. In contrast, the government "books" and maintains property at acquisition value, potentially inflating and complicating disposition decisions.

- ***Planning/Project Controls***

  Involving all team members early in the planning stages of a project. D&D work should be approached with a "project" mentality, requiring a different set of management skills than needed for routine operations.

- ***Safety/Environmental Compliance/ Quality Expectation***

  Having strong and effective safety, environmental compliance and quality performance as an expectation in the pre-qualification process. This must be demonstrated through past performance and is an expectation throughout the performance period of the project

- ***Manage or Eliminate Risks***

  Managing or eliminating risks through identifying, analyzing, and responding to risk through decision analysis and innovative contracting methods. In addition, aligning procurement strategies and technical initiatives through integration of procurement and technical organizations.

But will all this work in DOE.....???

We recognize these are private sector practices, pursued in predominantly commercial environment. We also recognize that not everything that works smoothly and effectively outside the DOE complex can be instantly adopted for use within the complex.

Processes, practices, and approaches exist within a framework of (1) the organization, which includes management structure, strategic information, strategic skills, rewards and recognition systems, etc.; and (2) the environment or culture, which provides the support for the systems and processes which operate in the organization. The organization and culture at your site may not be the same as that which made the best practices identified in this report so effective for our benchmarking partners. The good news is that you do not have to be one of our benchmarking partners for their best practices to help you, but you do have to understand your own organization's culture, systems, and processes and then "adapt" the best-in-class practices to your own reality to make substantive improvements locally.

We also recognize that there are some very real barriers that may complicate your readily adapting these best practices, such as:

- Local Purchasing and Socio-economic Concerns
- Workforce Reduction Issues

- Property Disposition/Accounting Issues
- Private Financing Issues
- Necessary and Sufficient Technical Requirements
- Labor agreements
- Technology development transfer vs. proven technology

For example, the best in class firms visited employed generally accepted commercial accounting practices to record the cost of goods acquired, then recognized the depreciation of those goods in accordance with an established schedule. This allows these firms to make disposition decisions based upon the "real" value of the goods toward the end of their useful lives. One the other hand, the government generally "books" the acquisition cost of goods, and then continues to maintain the acquisition cost throughout the life of the goods. This could inflate the actual value of the goods and complicate disposition decisions by allowing the evaluation of the property to be unrealistically high.

The Team believes that these issues can be dealt with within the context of existing authorities for waivers, deviations, and testing. Therefore, the Team proposes to initiate a "proof of principle" pilot to demonstrate the efficiency and effectiveness of applying the best practices identified in this report to D&D activities in DOE.

In order to demonstrate several of the commercial best practices identified in this report, a proof of concept pilot project will be accomplished. It is anticipated that Rocky Flats Environmental Technology Site (Kaiser-Hill) will select a D&D project in FY99 for a pilot demonstration. A procurement plan will be developed to identify acquisition specifics and to identify the barriers to effective incorporation of appropriate commercial best practices. Kaiser-Hill and DOE/Rocky Flats Field Office will coordinate this effort with DOE Headquarters Office of Procurement and Assistance Management and the Office of Contract Reform to obtain support in removing the barriers identified. Subsequently, metrics will be established to measure the effectiveness of the pilot for the D&D Homepage. Other projects at other locations may be identified in FY99 to similarly demonstrate the proof of concept explained in this report.

Homepage

Finally, this report provides a description of a new Web Site benchmarking Homepage for D&D Procurement Best Practices. This Homepage provides this Final Report, site-by-site D&D procurement lessons learned and inquiry capabilities to obtain or share additional information. The Office of Procurement and Assistance management currently has a website *www.doe.pr.gov* that captures and displays many of the initiatives currently underway within the department and among the various contractors performing work at DOE facilities. Contained at this site are links to other sites that provide up-to-date information on regulations, access to other government agency innovative practices, and most important, a communication tool that provides easy access to the best practices being implemented within the complex. This site is being updated to provide access information specifically related to decontamination and decommissioning activities. In addition to this report, a mechanism will be provided for the sites to post a description of those experiences and lessons learned in this area. It is hoped that all sites will use the web page for this purpose.

Not an End, But a Beginning...

In conclusion, if the Department of Energy is going to achieve the strategic objectives of the world's largest environment clean-up of contaminated sites, then they are going to have to identify and implement leading edge thinking, practices and solutions. This report should serve not as the end of best practices, identification and implementation rather it creates a platform for a wide range of beginnings, and establishes a starting point for continuous improvement of DOE and contractor's processes, practices and initiatives to allow D&D to be performed safer, faster, better at reduced costs.

The approaches identified in this report will come to life by being shared, debated, and implemented in the context of organizational realities. Then, where appropriate, they need to be used and improved upon. We encourage the procurement and technical communities to use this document to facilitate an on-going dialog in ways of integrating the procurement innovations to accomplish their mission objectives.

1.0 Background

1.1 Business Case

America won the cold war. The Department of Energy and its Contractors played critical roles in this victory through weapons development, production and assembly over a fifty year period. This unprecedented accomplishment cost taxpayers billions of dollars and, unfortunately, resulted in a legacy of environmental hazards that are only recently being recognized.

Cleanup of the radioactive, chemical, and other hazardous waste left after 50 years of U.S. production of nuclear weapons is the largest environmental management program in the world, encompassing 353 projects nationwide. Current life-cycle estimates for cleanup total $155 billion. Completion of the scope of work of the program will take more than 50 years.

To reduce the monumental costs of the cleanup effort, DOE sites must seek, and find, significant opportunities to accelerate the scope of work of the cleanup. Therefore, we must explore opportunities to increase efficiency and thereby enhance performance that will enable the clean-up program to achieve its cleanup mission more quickly and at a lower cost. The Department has developed extremely ambitious goals and timetables, recognizing that significant cost savings and performance gains can be achieved through aggressive site cleanup and closure. In addition, this daunting challenge must be accomplished during a time of significant budget and resource restrictions.

In the post cold war era, DOE's emphasis shifted to environmental clean-up through Deactivation and Decommissioning (D&D) of certain facilities not required for the nations on-going defense or energy programs. DOE and its clean-up Contractors have prepared plans to accomplish major environmental restoration projects at DOE facilities on or before 2010 (the "Ten Year Plan"). This has resulted in clean-up (D&D) work definition, schedule and cost estimates not previously accomplished in the DOE Complex.

As DOE's "Ten Year Plan" came together, many new challenges were identified such as accurate baselining and estimating, efficient project management, waste management and disposal, special nuclear material clean-up and, of course, funding. DOE's "overnight" shift from weapons production to environmental clean-up and restoration within a ten year period requires a whole new contracting and subcontracting approach with emphasis on Commercial industry experience and practices. In response, DOE and its Contractors developed and implemented Contract Reform.

Key features of Contract Reform are performance-based accountability and initiatives, appropriate fixed pricing and competition, balanced risk/reward, and outcome orientation rather than process focus. The common element to effective Contract Reform implementation is DOE and Contractors' procurement strategies. Consequently, procurement management must play a leadership role to develop and implement new procurement strategies to appropriately support the objectives of the "Ten Year Plan".

In order to implement D&D procurement strategies under Contract Reform, it is important to understand what D&D procurement practices are being utilized in the commercial industry. Accordingly, through sponsorship by the DOE/Contractor

Purchasing Council, a commercial D&D procurement benchmarking project was initiated. Procurement representatives from Headquarters, Rocky Flats, Savannah River, Pantex and Argonne participated in this project. The project team selected four commercial nuclear plants to benchmark that have completed or are in the process of facility D&D work. The four plants are Oyster Creek, Trojan, Fort Saint Vrain, and Maine Yankee. The benchmarking visits identified several new procurement strategies and confirmed many other practices already being implemented under DOE's Contract Reform initiatives.

This Final Report provides the benchmarking results and identifies best practices for D&D procurement.

Benchmarking:

The term "benchmark" comes from geographic surveying. In surveying, it is the process of taking a measurement against a specific reference point. For process improvement purposes, a benchmark is a measured "best-in-class" achievement, recognized as the standard of excellence for a particular process.

Benchmarking is more than simply comparing one's own organization against another. Benchmarking provides a focused, data-driven decision-making tool to implement change.

Benchmarking itself provides us with a methodology for learning. Benchmarking is a methodical process involving careful research and an understanding of our own processes, products and services. This process helps us to gain management support for improvement, identify those who perform well, determine what needs to be improved, and incorporate what we have learned to change our performance for the better.

The desired end result of benchmarking is the identification of best practices that lead to superior performance. Benchmarking involves seeing a need for change, discovering what to change, learning how to change it, and developing a vision of the future state. To change, we must be willing to change and adapt, share information with others, be open to ideas from the "outside", and focus "how to change."

To increase the chances of achieving change based upon our benchmarking recommendations we should tie our benchmarking efforts to our organization's strategic planning and goals. This helps us to obtain leadership support -- leadership support is vital to implementation. A successfully conducted study, which sits upon a shelf, has accomplished nothing; implementation is the part of the benchmarking process that improves our performance and achieves our vision of a future state.

1.2 Purpose / Objectives

Learn from others experience and practices. This was the primary purpose of the benchmarking project to address the new D&D procurement challenges across the DOE Complex in consideration of the following objectives:

- Identify type(s) of contract / subcontract approach that works best for D&D
- Identify methods for incentive-based contracting / subcontracting
- Identify improved source selection methods

- Identify best property disposition process and lessons learned
- Identify commercial labor relations and workforce restructuring practices
- Identify best D&D procurement practices

Each of the foregoing objectives and the associated findings are explained in greater detail in Section 2.2 of this report.

1.3 Report Organization

Section 1.0 of this report provides the background, purpose and objectives of the report. Section 2.0 presents an overview of the D&D procurement benchmarking activities from which the lessons learned and best practices were derived. Section 3.0 provides an explanation of a new D&D Procurement Best Practices Homepage and Section 4.0 provides wrap-up conclusions.

2.0 Overview of D&D Procurement Practices at Four Commercial Nuclear Power Plants

2.1 General Information

Listed below is a brief description of each of the nuclear power plants, some general background information and a current status of each facility's D&D efforts.

2.1.1 Oyster Creek:

Oyster Creek Nuclear Generating Station located at Forked River, New Jersey, is operated by GPU Nuclear, Inc. GPU Nuclear, Inc., operates two commercial nuclear power plants at Oyster Creek and Three Mile Island and an experimental unit, Saxton, which was placed in safe store in 1972. Oyster Creek is a boiling water reactor, capable of producing 640 megawatts of electricity. Oyster Creek has operated for 29 years and has an operating license that extends to the year 2009. With the expected deregulation of the industry, it was decided by GPU that the plant would not be economically competitive and should move to the D&D stage. Therefore, GPU is in the planning process of D&D.

GPU is planning on acting as the Decommissioning Operations Contractor (DOC), when they go to D&D and will establish an integrated team and supplement with specialty contractors. Their objective is to perform as much work in-house in order to reduce job loss; however, they will also enter into specific contracts, on a teamed basis for additional support.

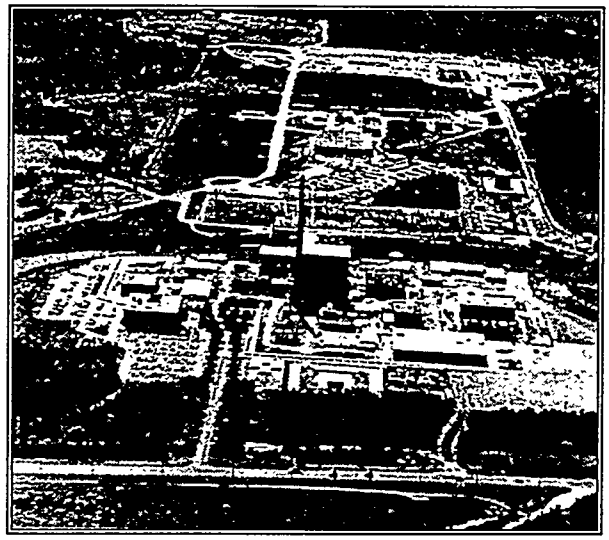


Figure 1. Oyster Creek Nuclear Generating Station

2.1.2 Trojan:

The Trojan Nuclear Power Plant, located at Rainier, Oregon, is operated by Portland General Electric (PGE). Trojan is a pressurized water reactor that commenced operations in 1976 and is capable of producing 1100 megawatts of electricity. In 1992, PGE was faced with a decision regarding major maintenance of their steam generators, at the same time the area was

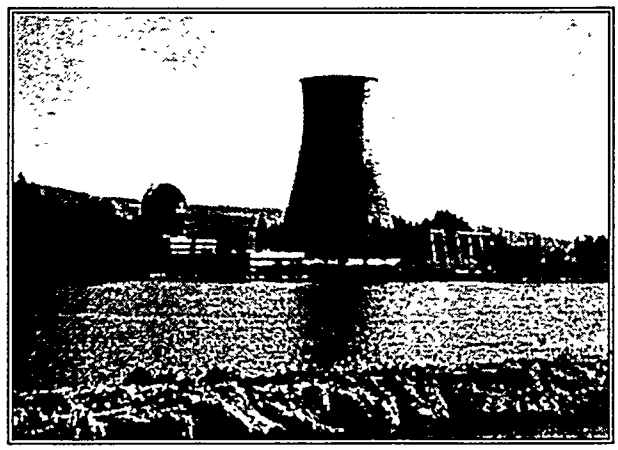


Figure 2. Trojan Nuclear Power Plant

experiencing an abundance of inexpensive power due to excess capacity of the hydro-electric generated power from Canada. A cost-benefit analysis determined that it was in the best interest of the stockholders and ratepayers to shut down Trojan prior to the end of its design life instead of incurring the expense to repair and/or replace the generators. PGE ceased its nuclear operation in 1993 and has begun decommissioning activities to totally close the plant.

PGE's approach to D&D is performing D&D as the integrator with several specialty contracts. They rely on detailed up-front and multi-year planning and adequate in-house resources.

2.1.3 Fort St. Vrain:

Fort St. Vrain Nuclear Generating Station, located 35 miles north of Denver, is operated by Public Service Company (PSC) of Colorado and received its operating license in 1973. The license was for a period of 60 years. The plant went online in December 1976. Fort St. Vrain was a high temperature, gas-cooled reactor, capable of producing 330 megawatts of electricity.

PSC notified the Nuclear Regulatory Commission (NRC) in 1988 that it had decided to halt Fort St. Vrain operations early because of high operating costs and the plant's frequent shutdowns. The company closed the reactor permanently the following year.

The NRC staff in 1992 authorized decommissioning in accordance with the utility's plan. Decommissioning was completed in 1996. Based on the decommissioning activities conducted by the licensee, NRC's review of the company's final radiation survey report, and NRC inspections and confirmatory surveys, the agency concluded that the site and facility were suitable to be released for unrestricted use and terminated the nuclear operating license in 1997.

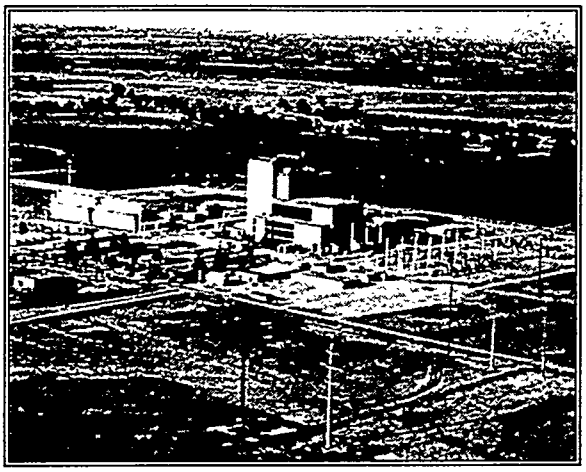


Figure 3. Fort St. Vrain Nuclear Generating Station

In June, 1995 a project was started to repower the plant for continued power generation capability. The plant was fitted with a gas-fired turbine capable of generating 130 MW of electricity, and began providing power to the grid in May, 1996. At the time of the team's visit in April, 1998, Public Service Company of Colorado was considering additional projects to recapture the 1100 degree F. discharge from the gas turbine and route it through the old steam generators to generate an additional 100 MW of electricity, should the power demand call for such additional capacity.

2.1.4 Maine Yankee:

Maine Yankee Nuclear Power Plant, located at Wiscasset, Maine, is operated by Maine Yankee Atomic Power Company. Maine Yankee is a pressurized water reactor that commenced operations in 1972 and is capable of producing 820 megawatt of electricity. In 1997, the Board of Directors voted to shut down Maine Yankee due to deregulation and economics.

Maine Yankee as the owner and Entergy, a management contractor, will perform as an integrated team, employing Duratek as a firm fixed price characterization team, and Stone and Webster as a Firm Fixed Price D&D contractor.

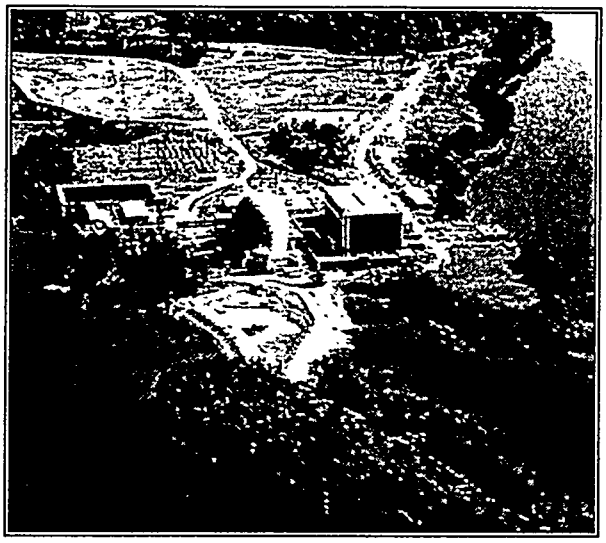


Figure 4. Maine Yankee Nuclear Power Plant

Appendix A provides a complete matrix of all benchmarking findings, lessons learned and best practices for each nuclear power plant.

2.2 Lessons Learned/Best Practices

This section of the report discusses in more detail the "best of the best" practices and lessons learned from the survey participants.

2.2.1 Project Acceleration Saves Big Money

All the plants surveyed as part of this benchmarking study have elected to shut down their facilities well in advance of expiration of their operating licenses, and to pursue D&D activities on an accelerated schedule. Cited as the major benefit to this approach is the substantial cost savings that can accrue to the ratepayers and owners who must finance such operations. Once a plant is taken off line and is no longer "earning its keep", failure to proceed with the D&D incurs costs.

Savings from accelerated D&D can be derived from:

- Present value of the work. It is obvious that the amount of money required in today's dollar is substantially less than that which will be required in future years to perform the work.
- Mortgage reduction, meaning costs consisting of, but not limited to, utilities, security, maintenance, surveillance, and inspections.
- Reduction in labor costs through the planned reassignment or separation of the operating workforce.
- Conducting such operations in a known regulatory environment. It is not expected that the regulatory burden of nuclear operations and D&D will become less in the outyears, and the potential for additional costly

regulations is great.

Lastly, accelerated contracting/subcontracting and project completion saved significant dollars as

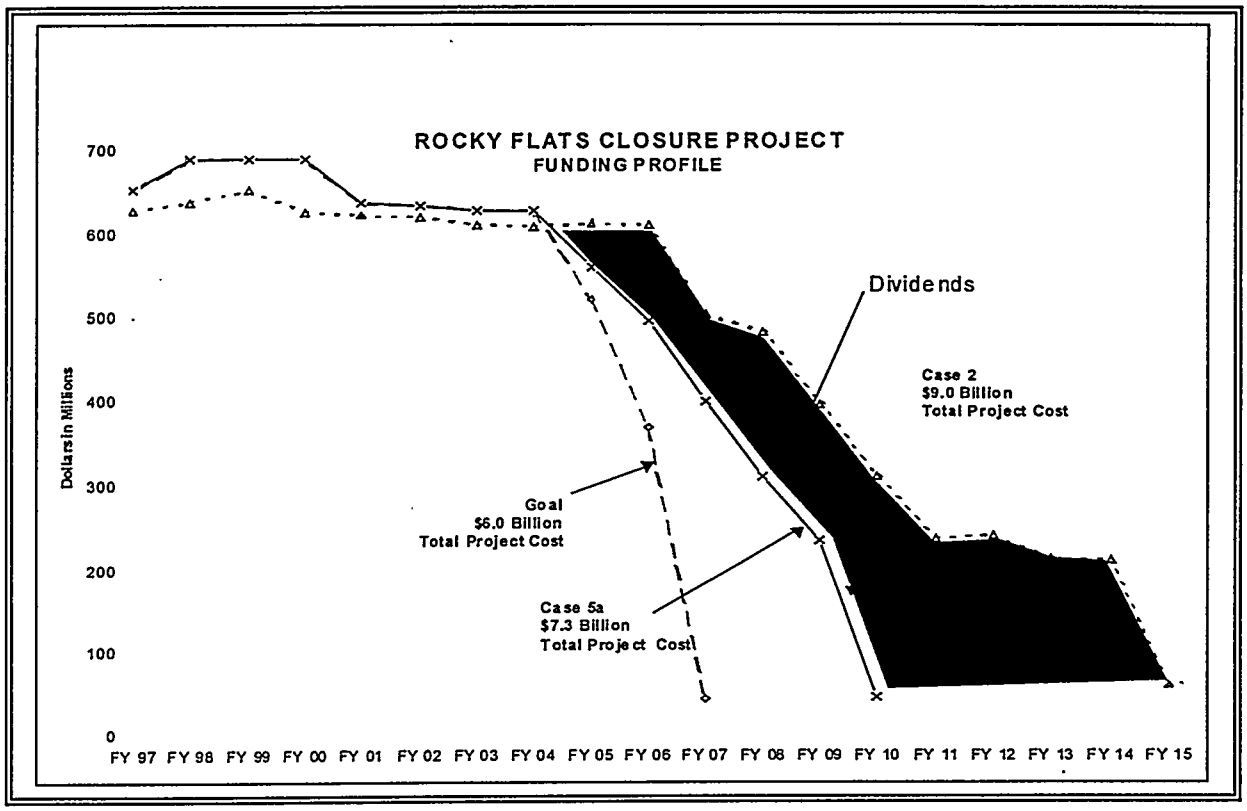


Figure 5. Accelerated Project Benefit

pictured in Figure 5.

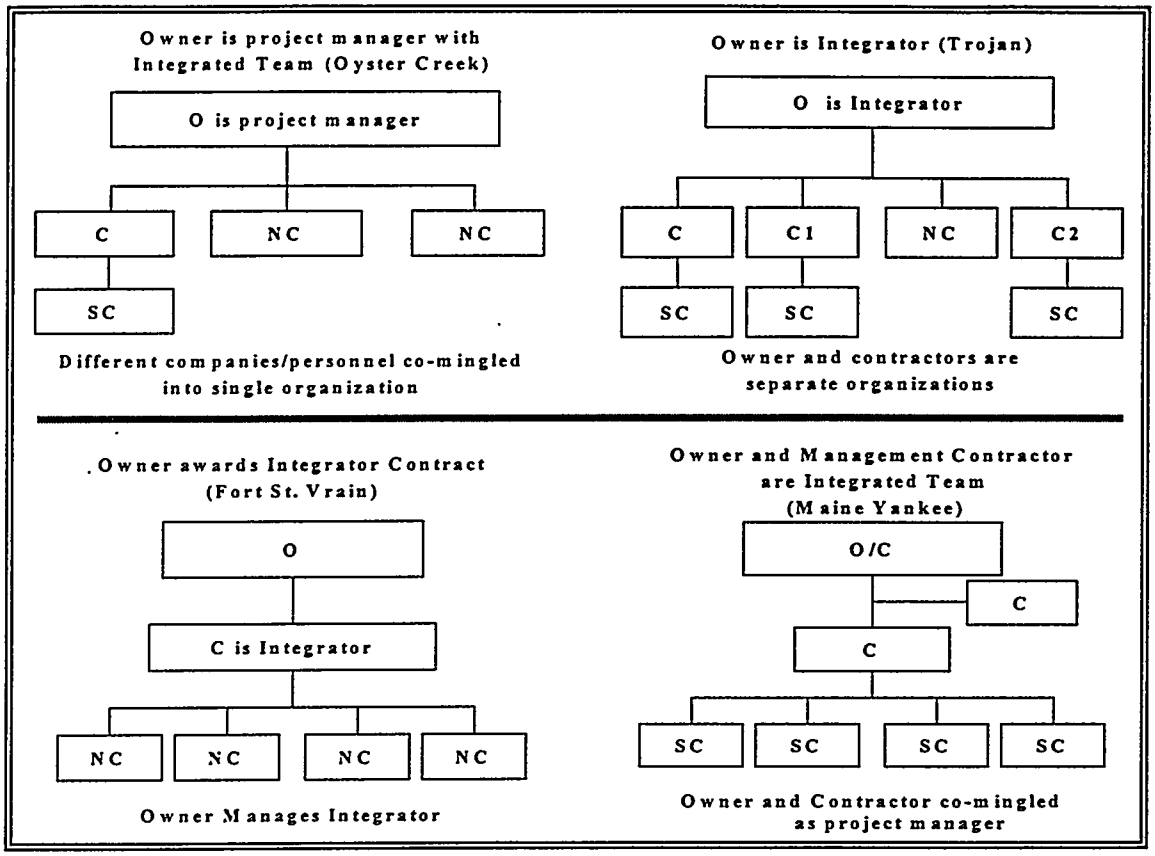
2.2.2 Innovative Contracting Models Solve Old Problems, Save Money/Time

Commercial best practice contracting models begin with effective fundamental discipline to plan and prepare good scope, schedule, cost estimate and identification of special objectives. This is followed by identification of in-house core competencies and available resources to accomplish the work. Subsequently, a make/buy determination is accomplished (albeit somewhat informal). Then, if outsourcing is selected, the contract/subcontract is awarded on a best value basis usually through competition.

Owner/contractor/subcontractor roles and responsibilities are established up front based on the contracting model utilized.

Commercial models range from the owner as project manager over an integrated contract team, to an owner and management contractor as an integrated team over D&D contractor(s). Four commercial contracting models are diagramed and are explained below in Figure 6.

Another best practice identified is up-front determination of the elements for source evaluations. Although routinely performed by DOE and contractors in the complex, it was notable that the commercial practice (although not required) is to utilize this



approach as well. Figure 7 provides one example of source evaluation guidelines utilized by one of the companies benchmarked.

Four commercial models: *O = Owner* *SC = Subcontractor*
C = Contractor *NC = "Niche" Contractor*

Figure 6. Commercial Contracting Models

EXAMPLE: SOURCE EVALUATION CRITERIA UTILIZED AT TROJAN

1) Overall Cost
2) Reasonableness of proposed rates for delays and extra work time and materials
3) Ability to meet schedule
4) Commitments to equipment availability
5) Demonstrated experience moving heavy equipment
6) Use of proven techniques
7) Demonstrated project management experience
8) Prior experience at Trojan
9) Technical expertise, qualifications & experience on comparable projects for key personnel assigned to project
10) Commitment to keeping radiation exposures to ALARA (As Low as Reasonably Achievable) & minimizing rad waste volumes
11) Adequacy of bidders Quality Assurance program
12) Entrepreneurial options (alternate proposals)
13) Technical evaluation of bidder's proposed method of performing work & equipment supplied

2.2.3 Performance Based Incentives (PBI's) Work

PBIs are used extensively in commercial contracting because they work. The objectives established by DOE's Contract Reform initiatives regarding performance based contracting are consistent with commercial best practices and if implemented properly will significantly improve D&D performance and cost effectiveness. Figure 8 below provides a summary of the commercial PBI objectives.

Performance-Based Incentives (PBIs) Work

Commercial Objectives:

- Outcome Orientation rather than process
- Force improved scope definition, scheduling and estimating
- Focus entire project on what is important (including safety and cost effectiveness)
- "Right" work is emphasized
- Increase project management discipline and reporting
- Measure the work progress to get attention
- Increase innovation and productivity
- Engage (reward) workforce with fee sharing
- Pay for completion performance, not efforts
- Accomplish more work with same funding level

Figure 7. Commercial PBI Objectives

Although some commercial companies utilize target labor hours with incentives, most are using Firm Fixed Price (FFP). Definitive scopes of work are critical for FFP and one company awarded a FFP site characterization contract and invited all potential follow-on D&D bidders to participate in the characterization at no cost to the owner. This resulted in a very effective scope of work which the bidders fully understood and was effectively applied under a FFP Request For Proposal.

2.2.4 Competitive Use of Prequalified Vendors

In selecting suppliers for the D&D effort, the plants that have passed this phase (Maine Yankee, Trojan and Fort St. Vrain) relied upon the firms whose names stand out in the decommissioning field. Within this set of suppliers, the plants chose a select set of contractors to act as business partners and participate in the competition for the work. Suppliers that were not in the set of pre-qualified suppliers, even though they possessed the necessary qualifications, were denied an opportunity to propose on the work, on the basis that the plant had sufficient competition among qualified suppliers. The awards that were made were based on negotiated, "best-value" concepts, rather than exclusively on low price. In addition, it was acknowledged that certain specialty work would fall to a smaller number of "specialty" contractors.

2.2.5 Unproven technologies are risky and time consuming – Keep it simple

Technology in the decontamination and decommissioning field is growing, and there exists among the technical community an urge to "find the better mouse trap". While potential rewards for such innovation may be great, the risks of pursuing a D&D approach which has not yet been proven are

greater in terms of costs and schedule impact, if the technology fails. A theme common to the plants interviewed is "keep it simple".

This is not to say that the plant personnel are uninterested in technological advances; rather it is a sign that they are not willing to gamble with ratepayer and stockholder assets. Also, the plants or their management contractors recognized that the expertise for choosing the right technology lay more with the D&D contractor than it did with the plant management and operations personnel. In order to achieve the best of all worlds, Maine Yankee and Fort St. Vrain, utilized performance based statements of work and firm fixed price contractual instruments. They believed that defining the work in terms of the ultimate desired outcome, and passing the risk for financial and schedule performance to the experts, would result in the selection of the best practices and technologies to accomplish the work. The Team concurs with this approach as representing the best practice.

2.2.6 Finish Line Focus/Closure Culture

Habit 2 of Steven Covey's book "The Seven Habits of Highly Effective People" is "Begin with the End in Mind®." Site closures and D&D projects must begin with a vision and "end in mind." One of the main challenges is that of creating a finish line focus and closure culture. Many times conflicting objectives involving multiple stakeholders, concerns for downsizing, and retention of technical skills and individuals with plant specific knowledge presents a difficult and complex problem.

Whenever a plant moves to the decommissioning phase. management is faced with the dilemma of how to retain personnel knowledgeable of plant history and determined necessary for successful decommissioning versus the separation of surplus personnel. This is especially difficult when the ultimate decision on the plant's future has not been determined (i.e., total demolition or reuse). The plants surveyed as part of this study addressed this issue primarily through the use of employee incentives. For selected personnel who stay with the company during the decommissioning phase, monetary incentives are provided. Early retirement incentives, placements at other locations within the company, where possible, and career assistance services were provided to personnel not retained.

For those personnel retained with the necessary skills, clearly one of the most difficult issues to deal with is the shift from an "operations" mentality to "closure" mentality. Through all the years of operation, management places considerable effort in the well being and safety of its employees, and the employees in turn feel a strong sense of loyalty and pride in their employment. In many cases, the personnel are long service employees. Their lives and livelihood, and their families' security has depended on the continued existence of the plant. Due to these emotional ties to the plant and for job security reasons, the tendency may be to drag the project out as long as possible. The challenge is to overcome the shock of closure and move forward.

The right approach to addressing this issue is largely dependent on the setting and the culture at the specific site. Maine Yankee elected to go to an outside contractor for D&D work and allow the Decontamination Operations Contractor (DOC) to come in and "rip-and-ship." Oyster Creek's objective was to perform as much work in-house in order to mitigate personnel reductions. The team found

various ways to deal with the issue, but a common theme among the plants was to "focus on the finish line."

2.2.7 Property Disposition

Major decommissioning work such as a nuclear power plant produces excess equipment that represents substantial investment by the plants. Spare, unused equipment, alone could be valued in the hundreds of millions of dollars. There is a natural desire to recover as much of this investment as possible. Part of the delusion around this effort is a belief that the value of the equipment in the plant will pay a substantial portion of the decommissioning costs. While the decommissioning team makes attempts, the realities are that, except for major components, the costs and effort expended to sell the plant remnants outweighs any recovery through the sale. Even with the major components, the problems with interchangeability between the plants and costs associated with certifying components for use at a particular site make success in the nuclear aftermarket seldom beneficial.

Several industry sales agencies exist for advertising the sale of nuclear components. NUS Corp. maintains a database for subscribers called RAPID. Additionally, Hackman Capital Partners provides a website for posting items for sale at www.buynuclear.com.

2.2.8 Planning/Project Controls

All plants surveyed emphasized the importance of early involvement by all entities in the planning phase of the work. Exclusion of any segment of the operations staff (i.e., procurement, finance, accounting, etc.) would result in less of a product than was necessary for success.

D&D activities must be approached with a "project" mentality versus an "operations" mentality. In decommissioning, a different set of skills is needed for managing cost and schedule than that needed to manage day-to-day production schedules and costs. In the evaluation of subcontractors for the work to be done, considerable emphasis was placed on the proposers' project management and project controls expertise.

2.2.9 Safety/Environmental Compliance/Quality Expectation

All of the companies benchmarked stated that strong and effective safety, environmental compliance and quality performance are pre-qualification expectations as demonstrated by past performance. Further, these expectations are maintained throughout the performance period on the project.

2.2.10 Manage or Eliminate Risks

Contracting for decontamination and decommissioning of facilities is a complex problem that involves multiple objectives and uncertainties. Clearly, no course of action may achieve all objectives, so one must consider the trade-offs between the benefits offered by the various alternatives and associate the organization's attitude toward risk. Risk is the element of uncertainty in an undertaking and the possibility that actual future returns will deviate from expected returns. In order to manage or eliminate the risks associated with D&D activities requires decision analysis to integrate the results so that a course of action can be selected. Although, in general, decisions made in organizations are ultimately the responsibility of an individual, often a group of people will participate in the decision-making process. This is where effective procurement

planning and alignment of procurement strategies and technical initiatives requires the successful integration of procurement and technical organizations.

All plants utilized methodologies for identifying, evaluating and responding to risks in the procurement process. Procurement, project and technical personnel are involved in the early planning stages and in writing clear and concise specifications, recognizing all "loose ends" represent financial risk. Trojan utilizes a "work window" provision in their contracts to reduce the cost and schedule risks associated with unscheduled downtime or activities that are affected by two contractors performing work requiring interfaces. This required each contractor to be flexible and maintain a schedule without a constant request for change orders.

Most plants require offerors, to submit "what-if" pricing for add/deducts up-front in the competition phase. Offerors are also encouraged to submit alternate proposals in order to reduce contingencies in bids necessary to limit risk. All elements of the proposal are evaluated, compared and risk establish for use in decision analysis. A useful tool that provides a structured method for identifying, evaluating, and responding to risks is the *Project Management Scalable Methodology Guide - Risk*, published by AMX International, Incorporated and is depicted in Figure 8.

Risk

	Priority			
Area	*1* *Not a significant investment; familiar project tasks; low risk technologies; low impact of project failure.*	*2* *Moderate investment; some unfamiliar tasks and technologies; medium risk impacts.*	*3* *Significant investment; unfamiliar project tasks; new or innovative technologies.*	*4* *Complex project with potentially volatile risk issues and exposures; uncertainties inherent in plan and technologies.*
Risk Elements Analysis	Use management judgment to list expected risk areas; compare project objectives to risk items and identify manageable risks.	Document risk areas and evaluate low-medium-high risks; identify risks with significant impact.	Establish structured methodology for identifying, quantifying, and assessing all potential project risks.	Document risk identification, probability, and consequences for objectives, specifications, and stakeholder interests; employ Delphi, multi-attribute utility and PERT analysis.
Risk Avoidance and Mitigation	Identify technologies or approaches presenting unattractive risks; plan actions to minimize risk exposure.	Assign study teams to develop risk avoidance and/or mitigation plans for excessive risk items.	Develop risk deflection strategies for all significant project risks; incorporate adaptive actions into project plans.	Conduct cost/benefit analysis to select candidates and strategies for risk deflection.
Risk Management Plan	Structure PM approach and work processes specifically to address risk areas and exploit opportunities; use modular and phased approach to compartmentalize risk and minimize risk compounding.	Address each significant risk item and apply a specific PM or technical approach to minimize, manage, and control risk events.	Develop action steps and staffing to reduce uncertainties and control risk areas.	Document plans for risk focused management attention to respond to all risk areas; apply risk templates (or lessons learned) to project life cycle.
Risk Metrics	Identify issues to monitor using subjective or qualitative risk assessments; follow-up	Assign all risk areas low-medium-high assessment and update and report status and trends; use	Develop measurable indicators or risk exposure; report status and trends.	Develop metrics for risk areas, report status and trends; track impact risk control actions on

	reporting risk issues at periodic reviews; highlight high risk areas and adverse trends.	qualitative or subjective metrics if none better available.		lessening risks; focus on areas not responding to corrective actions.

Figure 8. Project Management Scaleable Methodology Guide

EXAMPLE: "WORK WINDOW" CONCEPT LANGUAGE USED BY PGE AT TROJAN

"A finalized schedule will be developed during contract negotiations between PGE and the Bidder. This schedule will be used as the basis for addressing delays on the project. The delays will be addressed using a work period concept. The subject schedule will have defined work periods for the scope of work addressed in Bidder's Technical and Commercial proposal. This schedule will be based on a 40-hour week (4-10's) schedule. Delays during the project caused by PGE or other PGE contractors will not be compensable unless the work period is extended or overtime is required to meet the schedule. Each potential delay will be documented as it occurs and at completion of that work period, delays will be addressed as a whole using the work period concept. The specific work periods will be defined during the contract negotiations. Typical work periods would be 1) mobilization through lift 2) package preparation 3) package preparation to component shipment. Extra costs or additional work hours required to complete the scope of work contained in the Bidders proposal, within the scheduled periods due to the performance of the Bidder are the responsibility of the Bidder. If the work is completed earlier than scheduled, the respective fixed price portions of the contract will be paid in full."

While all plants recognize and assess the risk impact, Maine Yankee incorporates solicitation language that specifically requires offerors to communicate assumptions, quantify and qualify such assumptions, and assign appropriate risks and consequences by completing a Risk Matrix (see example). Once this information is received, a Kepner-Tregoe analysis and adverse consequence analysis are performed by the contracts, project and technical personnel. The objective of these analyses is to apply expert judgement in the areas of cost, schedule and technical performance, which is qualitative by nature, and convert this to a quantitative form through a probability assessment (see example). A Refined Risk/Cost Profile and Maximum Estimated Risk is then derived for each offeror for use in decision analysis.

EXAMPLE: RISK INVENTORY PERFORMED BY MAINE YANKEE

(Note: Actual figures/information have been revised to protect confidential information)

Risk Inventory			
Event	**Discussion**	**Impact**	
Berm on XYZ – included in bid ($600,000)	Included as an option in base bid. We select this option, price added to base bid.	Impact Probability Net Impact	$600,000 1 $600,000

PCBs in paint greater than MDA limits	Question #104 See Note (2) on letter dated xx/xx/xx	Impact $2,500,000 Probability .1 Net Impact $250,000
Rubbilization of concrete structures	See Note (a) on letter dated xx/xx/xx	Impact $1,500,000 Probability .2 Net Impact $300,000
Restricted area roofs contaminated	Maintained for risk of fryable asbestos	Impact $350,000 Probability .5 Net Impact $175,000
Excludes all licensing fees	Licensing fees were accepted as part of the base bid Note on letter dated xx/xx/xx	Impact $4,000,000 Probability 0 Net Impact $0
Containment outer building wall disposed to local landfill	Straight estimate of impact and probability	Impact $600,000 Probability .3 Net Impact $180,000
MY has responsibility to drain systems and oil, remove batteries, radioactive material backlog, etc.	Accept risk in this area. No additional cost See Note (d) on letter dated xx/xx/xx	Impact Probability 0 Net Impact $0
Facilities outside of scope for dismantlement: Building A, Building B, barge slip	Accept risk in this area. No additional cost Item (5) on letter dated xx/xx/xx	Impact $300,000 Probability 0 Net Impact $0

EXAMPLE: PROPOSAL INSTRUCTIONS UTILIZED BY MAINE YANKEE

"The Contractor shall identify and clearly communicate all assumptions made relative to its Base Proposal and shall quantify and qualify such assumptions and assign appropriate risks and consequences for those assumptions. (Attachment V)"

Attachment V

Request for Proposal No._____

Risk Matrix

Risk Event	Risk Probability	Risk Impact	Response Strategy

3.0 D&D Procurement Best Practices Home Page

With the shift in mission at DOE from production to clean-up, all sites within the complex, with the exception of those associated with the long term waste disposal mission, are executing at some level a program to demolish contaminated facilities. It is important that those sites with the experience base in this effort share their experiences and lessons learned so that others may continually improve upon the D&D process.

The Department of Energy has established a progressive approach to contract reform. It has encouraged its contractors through innovative contracting mechanisms, to identify and implement the best practices that exist in industry and academia, with the intent to drive down operating costs and increase the efficiency of those operations. Additionally, it has encouraged its contractors to "think corporately," meaning that the various sites, despite being operated by different contractors, should strive to standardize operations, consolidate purchases for maximum price benefit, share lessons learned and "steal shamelessly" from one another those practices which have demonstrated benefit. The Integrated Contractor Purchasing Team, which is the parent of the effort reflected in this report, has accomplished many of the objectives of the new approach, at a level once thought impossible to achieve.

The Office of Procurement and Assistance Management currently has a website, which captures and displays many of the initiatives currently underway within the department and among the various contractors performing work at DOE facilities. Contained at this site are links to other sites that provide up-to-date information on regulations, access to other government agency innovative practices, and, most important, a communication tool that provides easy access to the best practices being implemented within the complex. This site is being updated to provide access information specifically related to decontamination and decommissioning activities. In addition to this report, a mechanism will be provided for the sites to post a description of those experiences and lessons learned in this area. The site can be accessed at http:\\www.pr.doe.gov. It is hoped that all sites will use the web page for this purpose.

4.0 Conclusions

In conclusion, if the Department of Energy is going to achieve the strategic objectives of the world's largest environment clean-up of contaminated sites, then they are going to have to identify and implement leading edge thinking, practices and solutions. This report should serve not as the end of best practices, identification and implementation rather it creates a platform for a wide range of beginnings, and establishes a starting point for continuous improvement of DOE and contractor's processes, practices and initiatives to allow D&D to be performed safer, faster, better at reduced costs.

The approaches identified in this report will come to life by being shared, debated, and implemented in the context of organizational realities. Then, where appropriate, they need to be used and improved upon. We encourage the procurement and technical communities to use this document to facilitate an on-going dialog.

Benchmarking findings, lessons learned and best practices for four commercial nuclear power plants.

Topic	Oyster Creek	Trojan	Fort Saint Vrain	Maine Yankee
General Information	• Commercial Nuclear Plant • Boiling Water Reactor • Operated for 30 years (Year 2009 closure target) • Owned by GPU Nuclear • Located at Forked River, New Jersey • Reason for D&D: Deregulation / Economics	• Commercial Nuclear Plant • Pressurized Water Reactor • Operated for 25 years • Owned by Portland General Electric • Located at Rainier, Oregon • Reason for D&D: Deregulation / Economics	• Commercial Nuclear Plant • Helium Gas Cooled Reactor • Operated for 20 years • Owned by Public Service Company of Colorado • Located near Longmont, Colorado • Reason for D&D: Excessive Operation Costs	• Commercial Nuclear Plant • Pressurized Water Reactor • Operated for 25 years • Owned by Maine Yankee • Located in Wiscasset, Maine • Reason for D&D: Deregulation/Economics
D&D Contracting Approach	• Acting as Project Manager, Owner will establish integrated team with single contractor and other niche contractors • Based on Three Mile Island experience	• Owner is integrator with several specialty contracts • Relies on detailed up-front and multi-year planning and adequate in-house resources	• Owner awarded integrator contract • Integrator (Westinghouse) • Subcontracted niche specialty work	• Owner and Management Contractor (Entergy) are integrated team • FFP Characterization Contractor (Duratek) • FFP D&D Contractor (Stone & Webster) • Potential Conversion to Gas Turbine
Status of D&D	• Planning stage • Target start-year 2000	• Nuclear Steam Supply System D&D Complete • Balance of facility to be determined	• D&D completed • Gas turbine conversion phase 1 completed May 96	• Characterization Complete • D&D starts September 1998
D&D Schedule Strategy	• Detailed up-front planning integrated with business strategy	• Accelerate D&D to save money	• Accelerate D&D to save money	• Accelerate D&D to save money • D&D Contractors participate in site characterization at no cost to establish baseline prior to FFP competition • Area-by-area estimate and project controls
Contract /	• T&M with incentives and FFP	• Fixed Unit Rate with incentives	• FFP	• FFP ("clarified" assumptions

Topic	Oyster Creek	Trojan	Fort Saint Vrain	Maine Yankee
Subcontract Pricing	• Emphasis on FFP	and FFP • Some Cost Reimbursement		with risk matrix and mitigation plan) • Fixed prices for potential changes (regulatory, etc.) • Deconstruction mentality and culture
Incentives	• T&M - used target labor hour incentives where owner would pay 50% of dollars for the amount over and reward 150% for amount under • Used schedule incentives, safety incentives, and encouraged subcontractor to incentivize workers	• Incentives on target labor hours split 50/50 between owner and contractor • Owner pays costs without fee for overrun • Bonus opportunity for employees	• FFP – Profit	• FFP – Profit (progress payments on earned value) • 100% performance/payment bond • Potential bonus for D&D completion before 2004
Source Selection	• Pre-qualify offerors • Use best value technique, encourage alternate proposals and negotiate prior to award	• Pre-qualified business partners with competition to obtain best value through negotiated awards	• Pre-qualified sources with competition and negotiation to obtain best value	• Source selection plan up-front • Expressions of interest (22 top ENR companies) • Six Offerors participated in no-cost characterization study (6 mo.) • Four Offerors submitted D&D proposals • Clarification questions (2 mo.) with adverse consequences analysis • Major off-site evaluators consensus meeting
Terms and Conditions	• Commercial standard practices • Use incentives and liquidated damages	• Standard commercial practices • Established "work window" concept for alternative work during slow periods	• Standard commercial practices • Moving to new performance-based model for integrated team	• Used "construction" T&Cs • Standard Commercial practices • 100% performance/payment bond • Required Environmental Liability Ins. ($200m) • Performance contract (outcome oriented)... – Safety – FFP – 2004 site release
Procurement /	• Strong partnership	• Strong partnership	• Strong partnership	• Strong partnership

Topic	Oyster Creek	Trojan	Fort Saint Vrain	Maine Yankee
Technical Teaming	• Procurement matrixed to technical organization	• Procurement matrixed to technical organization • Project focus	• Procurement in line with project manager organization • Project focus	• Tri-party Team consisting of... – Project Controls – Tech. Oversight – Owner Contract Administration • Get what works to benefit Owner and Contractor
SB/SDB	• Corporate goals and a mentor protégé program	• Corporate goals	• Corporate goals	• No special emphasis or requirements • Market-place competition
Property Disposition	• Asset Recovery through RAPID • Nuclear asset inventory maintained by NUS • Inventory of spare equipment maintained by NUS for entire industry • Asset recovery group for major components only, otherwise everything is disposed of rapidly	• Asset recovery group for major components only, otherwise everything is disposed of rapidly	• Nuclear components disposed as waste • Balance utilized in conversion to gas turbine generation	• Use Hackman Capital Partners at www.buynuclear.com
Labor Relations	• Labor brokerage for union • Decommissioning - they would have a core group of craft which they would supplement through a Master Service Agreement through a brokerage subcontract	• IBEW maintenance / operations • Building trade utilized for construction • Utilize in-house labor services company (North American Energy Services) • No jurisdiction problems	• IBEW maintenance / operations • Building trade utilized for construction • No jurisdiction problems	• Building Trades do D&D work • No jurisdiction problems
Innovation and New Technologies	• Keep technology as simple as possible • Unproven technologies are risky and time consuming	• Request innovation through new tools and technology advancement; however, emphasis on off-the-shelf technology	• Request innovation through new tools and technology advancement; however, emphasis on off-the-shelf technology	• FFP will drive innovation/new technologies
Work Force Restructuring	• Retention of work force through incentives • Essential during D&D	• Emphasis on preserving technical skills through employee incentives • Work force reductions emphasized	• Emphasis on preserving technical skills through employee incentives	• 160 now, going to 120 then 100 • Emphasis on preserving core

Topic	Oyster Creek	Trojan	Fort Saint Vrain	Maine Yankee
		placement at other offices / locations	• Work force reductions emphasized placement at other offices / locations	competencies • Early retirement/severance incentives • Career assistance services
Best Practices and Lessons Learned	• Short-term Long-term planning is critical • Benchmark with industry leaders • Fixed Price Contracts best wherever possible • Keep technology as simple as possible • Asset recovery must be analyzed as part of D&D • QA/QC essential in oversight	• Planning is critical (short term - long term, including baseline scope and estimate) PGE "model" developed • Area by area D&D works best • Performance based incentives and weekly earned value are critical • Staff augmentation for professional services • Accelerate D&D to save money • Competition emphasis • Pre-award discussions / clarifications critical • Requirements specifications important • Internal and external teaming are critical • Safety and quality are expected • Task Order contracting works • Mine the budget to fund surprises and more work • Owner as integrator worked best for Trojan	• Owner must keep core competencies • Oversight roles / responsibility training is critical • Strong characterization study up front (by owner or contractor) • Educate regulators • Establish necessary and sufficient standards • Safety and quality programs established up front • Communications / teamwork (internal and external are critical) • Establish appropriate owner intervention practices • Don't go Cost Plus • Project controls training is critical • Use risk / reward sharing approach • Process records daily • Tie payments to performance • Competition emphasis • Owner controlled insurance • Create a "finish line" philosophy with boundary conditions	• Safety and Radiation Protection are critical • Aggressive Project Controls are mandatory – P-2 Analysis to identify problems early • Well-defined baseline • Outcome oriented performance-based contracting (FFP) • Up-front planning • Kepner-Tregoe Analysis with adverse consequences analysis • Risk matrix with mitigation plan and FFP for "what ifs" • Traditional Contracting Officer authority • Procurement rigor and documentation • Planning • Obtain best value Contractor (lowest cost doesn't always win) • Eliminate or manage uncertainties • Must have "Closure Culture" • Executives must work within Procurement process • Eliminate all unnecessary Owner interference