PROJECT MANAGEMENT
CONSTRUCTION SUBGROUP

ACQUISITION STRATEGY

WHITE PAPER

FY 2011

Prepared by:
Energy Facility Contractors Group (EFCOG)
Construction Management Working Subgroup

Table of Contents

1. Objective

In an effort to improve DOE project management effectiveness, the EFCOG Construction Management Subgroup selected several large ongoing capital projects and analyzed pertinent acquisition strategies and related technical issues to determine best practices and potential lessons learned to improve future performance.

1.1 Approach

A detailed questionnaire was developed by EFCOG and submitted to both the Federal Project Directors (FPD) and Contractor project management, to obtain data from both the Federal and private sector perspectives, on the following projects:

1. Waste Treatment Project (WTP), Hanford
2. National Ignition Facility (NIF), Livermore
3. CD-4 Highly Enriched Uranium Materials Facility, Savannah River
4. Mixed Oxide (MOX) Project (MOX), Savannah River
5. Spallation Neutron Source Project (SNS), Livermore
6. Waste Solidification Building Project (WSB), Savannah River

The following topical areas were included in the questionnaires:

1. Contract Type
2. Worksite Location Considerations
3. NQA-1 Considerations
4. Fee Considerations

2. Recommendations

The recommendations associated with the five key areas that the sub-committee felt could be derived from the questionnaires are as follows:

2.1 CONTRACT TYPE:

One of the most effective tools available to project managers during the planning and execution of assigned projects is the selection of the appropriate contract type. Although there are “standard” contract vehicles to utilize which are well understood by PM professionals, there is no prohibition for using combinations of contract types to obtain the best outcome for the project. Of the projects surveyed, several types and/or combinations of contract types were utilized effectively. Not surprisingly, the more complete/mature the design, the less risk to project success was realized. The Waste Solidification Building project is being constructed through the Savannah River Nuclear Solutions Management & Operations contractor by use of Firm Fixed Price (FFP) contracts. When the first contract was issued, the project design was nearly 100% complete. This not only minimized the risk to the success of the project, but allowed each of the prospective bidders to have finite information on which to propose. In a FFP environment, design maturity is one of the most essential elements for both the Government and the contractor community to ensure project success with a reduced chance of baseline challenges.

Another consideration that was brought to light as a result of the surveys is the concept of not allowing the Construction Management organization to “self perform” any of the direct design/construction work. DOE contracts for CM services in order to have a management presence/expertise and to award all contracts. By prohibiting the CM from self-performance, performance risk is, by default, assigned to the sub-contractors. Problems can arise when sub-contractors cannot perform to the requirements (e.g. NQA-1 requirements) or minimal responses to RFPs are received. DOE has experienced both of these situations in the past. A prohibition to self performance should be considered carefully during the acquisition planning.

Finally, a combination of contract types should be utilized when appropriate. The NIF project utilized both FFP and Cost-Plus Fixed Fee (CPFF) contracts during project execution. If the scope, risks, and design are matured, FFP may be the contract type most appropriate. However, if scope uncertainties exist or funding resources are limited or volatile, FFP is not the correct contract type to use. Anytime a contract requires renegotiation there is a strong tendency for the contractor to include compensation for past issues. This can be extremely detrimental to reported project baselines. Choosing the correct contract type, predicated upon the maturity of the project design, the stability of funding, and understanding and evaluation of all risks, is essential for project success.

2.2 Worksite Location Considerations

One of the areas explored by EFCOG via the questionnaires was whether or not the physical location of the projects on a DOE installation, resulted in any significant impact during the execution of the project. The target projects, located on DOE installations, generally shared similar requirements that impacted the prime contractor and their subcontractors and vendors. For example, permanent personnel were required to be badged and pass through security each day. Vendors and support contractors needed to obtain temporary badges and clear security with every load of materials and equipment. Once on site, all personnel were required to abide by the installation's rules and restrictions for all aspects of the work. One of the M&O contractors noted that they routinely experienced increased cost impacts of approximately 25% for construction work that occurred on their installation versus similar work performed off the installation, based upon their significant historical data. They noted however, that this increased cost was not seen for materials and equipment delivered to the site. It was also noted that in periods of economic downturn, the cost impact seemed to diminish.

The feedback from the target projects as a whole was inconclusive. However, because of the significant potential cost impact, as well as the likelihood that on-installation construction work could result in diminished contractor interest and competition, it is recommended that this element be considered during the acquisition planning phase.

2.3 NQA-1 CONSIDERATIONS:

There are currently relatively few construction firms that have an established, working NQA-1 program, nor are the firms accustomed to the additional rigor, and the time required to prepare for and to complete NQA-1 construction. This limits competition and increases the overall project costs. In addition, the construction firms have a very difficult time initially, due to the numerous document approvals that are required. The firms also struggle in maintaining the pace of construction that is assumed when bidding the project. But, unless the firm requests assistance, the government and its agent are limited in the amount of direction that can be provided without a monetary claim resulting. Further, even if requests for assistance are received, liability issues are generated when the sub-contractor works to direction provided. The probability of future claims increase in the event difficulties are experienced which can be in any way linked to the direction provided. Considerations should be given during the acquisition strategy development to provide an option for fixed-price construction companies to perform the work under the M&O/Prime contract quality program, or to provide their own nuclear quality program. Cost-reimbursable contracts could provide the government with more control over the work activities.

Procurement of the long lead, major equipment by the Prime (M&O) contractor has been helpful on the MOX Project due to the M&O's mature NQA-1 Quality Assurance program and suppliers list, however, suppliers were not up to date with all requirements and Compensatory Action Plans were required in all but one procurement. Equipment was able to be ordered much sooner than would have been possible if the major construction subcontractor(s) would have provided.

Procurement of long-lead, major equipment and selected bulk materials by the Prime (SRS M&O) under a fully mature NQA-1 program on the WSB Project was also beneficial in both cost and schedule. The alternative approach was to have construction subcontractors provide the equipment and materials but had potential for significant adverse cost and schedule impact.

The MOX project is primarily an NQA-1 facility. With the start of construction in late 2007, it quickly became evident that very few of the subcontractors and vendors retained any significant NQA-1 capabilities. Even those companies that had significant historical experience were in most cases found to be dated with regard to their ability to execute to NQA-1 standards. As a result, the MOX project greatly expanded its Quality Program and in most cases required the subcontractors and vendors to operate under the MOX Quality Program. In addition, MOX Quality personnel were required to be stationed within the shops and fabrication facilities throughout the United States at significant additional cost.

2.4 FEE CONSIDERATIONS:

The questionnaire feedback relative to fee tended to be project specific but there were a few common elements that seemed pertinent to the EFCOG objective.

The establishment of a more stable fee structure for multi year construction projects that are executed under an M&O, should be considered. The following comment explains the basic challenge:
"*The fee structure has been effective to date but can be improved upon in future. Fee contribution to a fee pool under the M&O contract arrangement "expires" at the end of each fiscal year. Any fee not earned as of time/date certain is lost regardless of cause and/or effect. This is not the most effective fee structure for multi year large Capital Line Item Projects wherein the original delivery date (of a piece of equipment, for example) could be slipped with no negative impact (cost or schedule) to the overall project but the fee is reduced or lost simply because the "clock ticked midnight". This is particularly problematic for fee associated with CPI and/or SPI which can recover the next reporting period. The ability to defer fee earning beyond fiscal year end would be an improvement."*

Although at the outset of negotiations, it is generally the goal of DOE to keep the fee structure reasonably simple, more times than not it seems that the final product is overly cumbersome. In some cases the fee can become so complicated that even the contractor has difficulty understanding and explaining how it works, which leads to the degradation of the intent which is generally to motivate the contractor to certain desired

behavior. One of the target projects reviewed for example, included award fee, fixed fee, incentive fee, milestones, shared cost savings and provisional fee with claw back provisions that spanned the entire life of the project. Many of the fee elements interrelate such that determination of the impact of routine events upon the fee is complex at best.

Recognizing that most of the prime contractors working for DOE are publicly traded companies, the utilization of “claw back” fee provisions that allow DOE to pull back previously paid fee, is problematic for these corporations.

3. APPENDIX

APPENDIX - QUESTIONNAIRE INPUT:

The following table provides a summary of the input provided by the projects.

Input	WTP	NIF	HEUMF	MOX	SNS	WSB
Percent complete	60	100	100	40	100	30
Direct Federal Procurement	Yes	No	No	Yes	No	No
Project within an M&O	No	Yes	Yes	No	Yes	Yes
Was incentive included in prime/M&O	Yes	No	No	Yes	No	No
DOE organization	EM	SC	NNSA	NNSA	SC	NNSA
NQA-1 quality requirements	Yes	No	Yes	Yes	No	Yes
Significant changes to CD-2 baseline	Yes	No	Yes	Yes	No	Yes
Significant changes to project plan	Yes	Yes	Yes	Yes	Yes	No
Fixed Price engineering/design	No	No	No	No	No	No
Fixed Price construction	No	Yes	Yes	Yes	Yes	Yes
Self performing thru direct hire	Yes	No	No	No	No	No
Did prime/M&O let the subcontracts	Yes	No	No	Yes	No	No
Type of acquisition strategy	DB	D-BB	D-BB	DB	D-BB	D-BB
100% design completion for construction	No	Yes	Yes	No	Yes	Yes
Was a specialty CM hired	No	Yes	No	No	Yes	No
Did CM hire the constructors	No	Yes	No	No	Yes	No
Was a single constructor hired	No	No	Yes	No	No	Yes
Was a specialty A/E hired	No	Yes	Yes	No	Yes	No
Approximate project value	$12B	$4B	$0.5B	$5B	$1B	$0.5B

The following were generally the most significant elements extracted from the EFCOG Questionnaires:

FPD = Federal Project Director

1.) WASTE SOLIDIFICATION BUILDING (SRS)

POC: Tom Cantey – FPD (803-952-3754) tom.cantey@nnsa.srs.gov

Contractor POC: Perry Stanley / Duane Berning perry.stanley@srs.gov; duane.berning@srs.gov

WSB (FPD): A single A/E organization performing Conceptual, Preliminary and Final Design as well as Title III services proved to be particularly effective. It provided continuity and "ownership" not possible when the design is "passed around" between phases.

WSB (FPD): Consider alternatives and include them in the Acquisition Strategy to maintain flexibility, reduce risk, and create potential opportunity. For large, complex projects, early, incremental, or partial CD-3 releases for construction/fabrication should be evaluated and implemented as appropriate. For early, partial CD-3 releases, design and baseline development must be sufficiently mature in those areas to reduce if not eliminate risks associated with the changes to early portions.

WSB (FPD): The WSB Project is located with the Savannah River Site. There are no indications that the location has had anything other than a very minor effect on the cost, i.e., the cost of employee initial General Employee Training and badging.

WSB (M&O): The WSB is located on the SRS. Effects of location on cost and schedule are indeterminate. No information was provided from the fixed-price bidders. Informal discussions indicated that the larger factor was the significant amount of construction in the area, due to on-going projects at SRS, ARRA activities and commercial nuclear construction nearby. Competition for craft labor is believed to be a significant driver for higher costs.

WSB (FPD): The fee structure has been effective to date but can be improved upon in future. Fee contribution to a fee pool under the M&O contract arrangement "expires" at the end of each fiscal year. Any fee not earned as of time/date certain is lost regardless of cause and/or effect. This is not the most effective fee structure for multi year large Capital Line Item Projects wherein the original delivery date (of a piece of equipment, for example) could be slipped with no negative impact (cost or schedule) to the overall project but the fee is reduced or lost simply because the "clock ticked midnight". This is particularly problematic for fee associated with CPI and/or SPI which can recover the next reporting period. The ability to defer fee earning beyond fiscal year end would be an improvement.

WSB (FPD): All major subcontracts have been Fixed Price. Subcontracts awarded to date have been effective and indications are they will continue to be. The WSB Project is perhaps an example wherein the collection of circumstances in its evolutionary life resulted in an ideal Fixed Price subcontracting situation. Having a very high percentage of detailed design complete at CD-2, obtaining CD-2 & 3 concurrently, and having funding available, greatly reduces project risk, particularly risk due to design change/evolution. Projects of lesser maturity at award/start of major construction subcontracting activities should consider alternate fee structures wherein some risk is held by the Client (DOE), and/or Prime or shared among the participants. Fixed price contracting in these situations may serve only to increase overall costs to the DOE due to perceptions and the need to increase contingencies at the execution level, i.e. the subcontractors.

WSB (M&O): Of even greater potential benefit was the inclusion of a multi-year PBI which essentially makes available 50% of any final project under-run as additional fee. Although potentially more lucrative for the contractor than typical sharing agreements, NNSA felt this fee was warranted for this project. The fixed price bids for facility construction were substantially higher than the government cost estimates (approximately 50% higher than estimated). These bids required the use of a large portion of available project contingency upon contract award, and reduced the available TEC contingency to 10% for the remainder of the project before any construction had begun. Because of this PBI, the M&O management very aggressively exercises change control, recognizing that 50% of all additional costs come directly from their available profit. This arrangement has resulted in the M&O exhaustively looking for alternatives to address arising issues. In the 9 months since contract award, little usage contingency has been required, and contingency reserves have actually increased to approximately 15% of to-go work.

One nuance in the fee structure, however, places unnecessary restrictions on NNSA's ability to determine and award fee. Under the Site M&O contract, any fee not earned at the end of a fiscal year is forfeited, with no ability to earn in the future. While this may be a beneficial structure for an "operating site," it does not translate well to large, capital line-item projects. The goal should be to maintain, or recover, project performance in order to meet the project baseline. As structured, the M&O is influenced not to do what is in the long-term interest of the project, but instead to take actions necessary to earn any available fee on an annual basis. These goals are frequently at odds, and can result in the M&O spending unnecessary funds to recover schedule, where a more reasonable cost-effective recovery would be more beneficial.

WSB (FPD): Market Condition" surveys relative to qualified labor availability and potential competition for resources at time of need should be undertaken at time of Acquisition Strategy development. If necessary, include in the Acquisition Strategy the need and cost and/or schedule impacts and risks. This may result in the need to deviate from current guidelines, practices, and/or other requirements embedded in M&O Prime contracts, etc. These "deviations" need to be captured in the Acquisition Strategy and included in the project baseline.

WSB (M&O): There are currently relatively few construction firms that have an established, working NQA-1 program, nor are the firms accustomed to the additional rigor, and the time required to prepare for and to complete NQA-1 construction. Consequently, the construction firms have a very difficult time initially, due to the numerous document approvals that are required. The firms also struggle in maintaining the pace of construction that is assumed when bidding the project. But, unless the firm requests assistance, the government and its agent are limited in the amount of direction that can be provided without a monetary claim resulting. Further, even if requests for assistance are received, liability issues are generated when the sub-contractor works to direction provided. The probability of future claims increase in the event difficulties are experienced which can be in any way linked to the direction provided. Cost-reimbursable contracts provide the government with more control over the work activities.

WSB (M&O): Cost performance on the project has been good. However, schedule performance has not met expectations. Schedule delays have been experienced due to slow ramp-up and document submittals/approvals from the construction sub-contractor. The sub-contractor has experienced significant “growing pains” in implementing and executing procedures and work required to comply with NQA-1.

WSB (FPD): Market survey or data collection to ensure ability to comply with current NQA-1 requirements during Acquisition Strategy development would be helpful. Assumptions that suppliers are or can easily become able to meet these requirements should be avoided.

WSB (FPD): Pre-bid qualification of bidders NQA-1 Quality Assurance Programs to specified requirements may be beneficial in identifying problem areas and weaknesses prior to bid. This approach may require additional resources and time which need to be included in the Acquisition Strategy.

WSB (FPD): Procurement of the long lead, major equipment by the Prime (M&O) contractor has been helpful due to the M&O’s mature NQA-1 Quality Assurance program and suppliers list, however, suppliers were not up to date with all requirements and Compensatory Action Plans were required in all but one procurement. Equipment was able to be ordered much sooner than would have been possible if the major construction subcontractor(s) would have provided

WSB (M&O): In theory, a fixed price construction contract was the ideal vehicle for the procurement of the WSB. The design was almost 100% complete, there was little new technology and the equipment that did require design was provided as Government Furnished Equipment. However, Fixed Price contracts provide the government (and, by extension the M&O acting as the Construction Manager) with significantly less direct control of how the work will be executed. Although lessons-learned and potential shortcomings of the construction sequence can be identified and communicated, the sub-contractor is not under the obligation to follow any guidance provided (safety and quality related issues excepted). In effect, the sub-contractor can proceed with a plan that does not appear to provide the best probability of success, but until schedule or cost

performance declines, any direction will result in a claim for additional funding in order to implement. Establishing a construction schedule has been especially problematic on the WSB due to the lack of experience of the construction sub-contractor in performing NQA-1 work.

WSB (M&O): Regardless of the time and the attention devoted to developing procurement and contract specifications, differences in interpretation inevitably occur. These differences can sometimes be significant. Although time-intensive, the Construction Manager (in this case the SRS M&O) and the construction sub-contractor should review the specifications line by line together and discuss how each interprets the requirements. Without this exercise, the construction sub-contractor will conduct his activities in accordance with his unilateral interpretation, which may not (and frequently doesn't) coincide with the intentions of the authors of the specification. Once the work has been performed, identification of misunderstandings or misinterpretations has a significant cost and schedule impact.

WSB (FPD): Procurement of long-lead, major equipment and selected bulk materials by the Prime (SRS M&O) under a fully mature NQA-1 program was beneficial in both cost and schedule. The alternative approach was to have construction subcontractors provide the equipment and materials but had potential for significant adverse cost and schedule impact.

WSB (FPD): Dividing the field construction into a few smaller subcontracts to be executed shortly following CD-3 was beneficial. Limited scopes of work and appropriate Quality Assurance requirements resulted in progress earlier than would have been achieved had the work been combined with larger subcontracts. This approach can be particularly effective if combined with early / partial CD-3 releases.

WSB (M&O): Having the M&O directly procure Long-Lead Equipment (LLE) instead of including procurement in the scope of the fixed price construction sub-contract (with the M&O acting as the Construction Manager) proved to be extremely beneficial for two reasons:

First, there is a cost benefit. In the typical accounting structure for the Site M&O, overheads are applied to all costs that come through the accounting system. When a sub-contractor executes a procurement, a sub-contractor mark-up for overheads is applied. This total then increases the bid for the fixed price construction contract, which then will have the M&O site overheads applied. By conducting a direct procurement, the sub-contractor overheads are avoided altogether, plus the M&O overheads are applied to a smaller value, reducing the amount further.

Second, firms are precluded for procuring equipment until QA plans are approved and issued. Today's nuclear industry is struggling with the re-establishment of NQA-1 programs. Consequently, significantly more time is required than a bidder assumes for having the Site approve the QA plans. The delays encountered can stress the project schedule from the very beginning of construction. Having the M&O procure the equipment upon approval of CD-3 can save many months on the schedule.

2.) NATIONAL IGNITION FACILITY (LLNL)

DOE POC: Scott Samuelson – FPD (925-423-0593) scott.samuelson@oak.doe.gov

Contractor POC: John Post (925-422-9493) post1@llnl.gov; jpost@llnl.gov

NIF (FPD/CONTRACTOR): With annual funding limitations, work awarded on a fixed-price basis was constrained to that which could be defined, negotiated, and paid for within currently available funds. Work that could not be segregated into discrete packages that could be completed with the funds available for obligation at time of subcontract award was not amenable to fixed-price contracting. Logically connected follow-on work could necessarily be treated as unpriced options to the initial subcontracts, or as separately negotiated sole source subcontracts. If options were not provided for in the initial award, or if pricing had to be negotiated after completion of pilot production, the NIF Project would have reduced negotiation leverage over what would be available even in marginally competitive procurements.

NIF (FPD/CONTRACTOR): The NIF Project Manager directed the project organization to work to the fullest extent as IPTs. These IPTs performed in a spirit of teamwork with participants empowered and authorized, to the maximum extent possible, to make commitments for the organization or the functional area they represented. While the leadership remained constant, the participation intensity of core team members and adjunct team members varied depending on the STEP/phase point of the particular WBS element. It was vitally important that all core team members remained a part of an IPT's decision-making process throughout the lifetime of the team. Team life cycle ran from the time of team chartering through turn over to NIF operations. These teams were very effective, as their actions and recommendations were based on timely input from the entire team.

NIF (FPD/CONTRACTOR): IPTs were a management methodology that incorporated a systematic approach to the early integration and concurrent application of all the disciplines that played a part throughout a systems life cycle. IPTs were multi-functional, multi-organizational groups formed to capitalize on the strengths of all participants in the processes assigned to the team. The NIF Directorate provided infrastructure and support for project controls, system engineering/experimental physics, personnel management, facilities support, public relations, information technology, business management oversight, administration, security, environmental, safety and assurances.

NIF (FPD/CONTRACTOR): The project was defined using the functional system product oriented WBS that included the Injection Laser System, Amplifier System, Final Optics System, Beam Delivery Diagnostics System, Integrated Computer and Controls System, Target Experimental Systems, and Conventional Facilities and Beampath Infrastructure Systems as the major products. The Integrated Product Team (IPT) leaders for each of the major WBS elements were charged with “cradle-to-grave” responsibility for the functional system under their purview, and they had to identify all the scope to be delivered.

NIF (FPD/CONTRACTOR): Working closely with industrial partners yielded technological breakthroughs essential for the NIF’s success. The faster and less costly glass production mentioned earlier is an example. Laser glass is the heart of the NIF laser system; it’s the material that amplifies the laser light to the very high energies required for experiments. The NIF’s laser glass is a phosphate glass that contains a chemical additive with atoms of neodymium. The NIF’s laser system uses over 3,000 large plates of laser glass. Each glass plate is about three feet long and about half as wide. If stacked end-to-end, the plates would form a continuous ribbon of glass 1.5 miles long. To produce this glass affordably and quickly enough to meet construction schedules, a new production method developed in partnership with two companies that continuously melt and pour the glass was used. Once cooled, the glass is cut into pieces that are polished to the demanding NIF specifications. Developing multiple sources to assure uninterrupted supply provided significant cost risk management production.

NIF (FPD/CONTRACTOR): Actions were also taken to prevent less routine occurrences with potential adverse schedule impact. For example, to minimize the risk of Beampath Infrastructure System (BIS) critical path installation falling behind schedule due to labor difficulties, contractual issues, or supplier problems, multiple shifts, dispute resolution, and a project labor agreement disallowing strikes or work stoppages were employed.

NIF (FPD/CONTRACTOR): A robust Value Engineering (VE) program was implemented to identify areas of potential savings. Six-Sigma experts were brought in to review assumptions, processes and management practices. Multiple VE initiatives were launched during the design phase of the NIF to reduce procurement cost of hardware. The Six-Sigma process improvement initiatives were implemented throughout the NIF line replaceable unit production organization. Further, production spaces were reconfigured to optimize throughput. Constructability reviews prior to each construction phase were conducted to keep looking ahead to identify construction/installation impediments and address them early. Industry experts were brought in to evaluate the best options to install the massive NIF beampath infrastructure components in a high-performance clean room environment.

NIF (FPD/CONTRACTOR): Learning curves were incorporated into both the schedule and cost estimates as part of the overall set of metrics used to assure high-quality, cost-effective production. A learning curve of 85% was assumed where appropriate for production rates and quantities and schedule projections. This approach, when coupled

with the additional tools of value engineering and lean Six-Sigma process improvement, often resulted in a yield better than planned. The return on investment of these improvements is estimated to have reduced the overall cost of LRU production by over $10M.

NIF (FPD/CONTRACTOR): A fixed-price subcontract provided the best cost control as long as there was a well-defined fixed scope of work and good industrial experience base for the required activities by putting the risk for cost performance on the subcontractor. This type of contracting approach was used in the design and fabrication procurements of facility and conventional hardware elements.

NIF (FPD/CONTRACTOR): High-quality bid packages issued only to pre-selected contractors led to a successful experience.

NIF (FPD/CONTRACTOR): The NIF Project utilized CPFF subcontracts where the scope of work was not amenable to a firm-fixed-price (FFP) subcontract, either through uncertainties inherent in the scope or where uncertain yearly funding could not be accommodated through options or segregated work as discussed above. The Jacobs Integration Management and Installation (IMI) contract for the Beampath Infrastructure System (BIS) was the chief example of a CPFF plus award fee.

NIF (FPD/CONTRACTOR): For each scientific system, NIF typically began procurement planning while the design was moving beyond conceptual stage. Early Method of Accomplishment Reviews led to many more outsourced subsystems than initially envisioned by the NIF's scientists and design engineers. These early reviews sometimes helped to avoid the risky ambiguity of attempting to structure a contract as "build-to-print, but with performance requirements."

NIF (FPD/CONTRACTOR): The planning phase for each NIF subsystem culminated with a Procurement Readiness Review by all NIF organization stakeholders, where the overall requirements, make-buy analysis, contract-type, updated cost estimate, document status (e.g., "released" in the NIF's document management system), bid/execution schedule, etc. and an extensive checklist were reviewed.

NIF (FPD/CONTRACTOR): As the requisition package was being assembled, NIF management would assign a Subcontract Administrator so that the make-buy and contract-type rational could be reviewed, and early discussions of bid strategy and bid list could be held. Because the number of units to be fabricated on the NIF's Procurement were often so much larger than typical LLNL Procurements, it was sometimes necessary for NIF Production to also perform a "capacity-analysis" on each bidder. On more than one occasion, the results revealed significant schedule risk. In nearly all cases, bidders were required to submit detailed, Gantt-chart schedules with their proposals—these would later be used to manage the supplier's progress towards promised delivery dates, and in fact were often the only tool available to help suppliers realize that they were trending to miss their promised delivery dates.

NIF (FPD/CONTRACTOR): As contracted efforts were completed, the submittal log was reviewed to ensure all required submittals had been received, and that all submittals had been reviewed. Inspection reports and all documents, including NIF-site testing reports necessary to assure "acceptance" by the NIF, were listed in the submittals log and, therefore, must have been shown as complete for contract closeout. DRs usually included proposed price adjustments, which were negotiated as part of the formal contract modification. The change control rigor described above nearly always ensured that all necessary contract modifications had been incorporated into the contract before the last units shipped.

NIF (FPD/CONTRACTOR): NIF maintained a culture of suppliers as valued participants in the project's success and partnering with contractors and vendors proved rewarding for the supplier as well. For example, a contractor supporting clean room operations said: "The project stretched our technical capabilities and has made us a better company."

3.) WASTE TREATMENT PROJECT

DOE POC: Guy Girard – FPD (509-376-3681) guy_a_girard@orp.doe.gov

Contractor POC: Mark Watts - Bechtel Procurement and Subcontracts Manager (509-371-5860) MTWatts@bechtel.com

WTP (FPD/CONTRACTOR): The project was originally acquired in the mid-90s under a fixed-price privatization concept to finance, design, build, own, and operate the WTP – whereby the Government would buy waste treatment services at a fixed unit price. This acquisition concept was terminated in 2000 due to excessive cost, risk, and other project management concerns.

DOE embarked on a fast-track to award a more traditional design, build, and commission contract with a cost-plus-incentive-fee (CPIF) pricing arrangement. The current WTP contract was awarded in December 2000.

Based on an analysis using pertinent decision criteria (maximizing competition, limiting acquisition complexity, maintaining privatization design and investment, DOE management and administration capabilities, ability to incentivize performance, and operational considerations), DOE selected a strategy of awarding one contract for a single design/construction manager to perform the work, including commissioning and transition to an operating contractor.

The acquisition process included appropriate acquisition streamlining techniques to ensure timely contract award and optimal contractor performance. These initiatives included: pre-solicitation information exchanges with industry; electronic solicitation distribution and acquisition processes; use of a draft solicitation; oral presentations; and, award without discussions.

WTP (FPD/CONTRACTOR): Some acquisition strategy changes were made during project performance.

In April 2003, the facility configuration was changed from one (1) High-Level Waste (HLW) melter and three (3) Low Activity Waste (LAW) melters to two (2) HLW melters and two (2) LAW melters. This design modification was intended to be a cost-effective way to accelerate completion of all HLW treatment by up to 20 years and save up to $20 Billion. The reduction in Low Activity Waste (LAW) treatment capability is expected to be offset by supplemental LAW-treatment technologies. This change was executed by Contract Modification No. A029.

In 2005, the Contractor projected significant increases in the Estimate-At-Completion (EAC). In response, the Secretary ordered a detailed EAC exercise by the Contractor that was then validated by the Army Corps of Engineers, and in parallel, commissioned an independent External Flow sheet Review Team (EFRT). The team included experts from industry, national laboratories, universities, and also included representatives from every major DOE supplier and competitor to BNI. The EFRT charter was, and the results of the review impacted the December 2005 EAC. The EFRT report was issued in March 2006, and the EAC was completed in May 2006. In December 2006, the Project Baseline was updated from $5.8B to $12.3B, and extended the project performance period from July 2011 to November 2019.

In January 2009, the Contract was modified from a CPIF type to a cost-plus-award-fee (CPAF) type, with a Total Estimated Contract Cost of $10.446B. The total available fee was established at $620M, which included a new award fee component and other fee structure revisions, as necessary, to properly align the project baseline and Contract and motivate Contractor performance.

WTP (FPD/CONTRACTOR): In retrospect, the following acquisition strategy decisions may have hindered the job as follows:

Business Model – Privatization became flawed by excessive financing costs, project enormity, and technical challenges.

Contract Type – In transitioning from fixed price to CPIF to CPAF, it became apparent that the contract types used in the early project stages were inconsistent with the actual project performance risks.

Close-Coupled Design – This concept did not allow technology maturity and design evolution to maintain pace with construction needs in order to meet the project schedule.

WTP (FPD/CONTRACTOR):

Lessons Learned:

The project did benefit or would have benefitted from the following:

Early risk identification.
Better understanding of alignment between performance risk and contract type.
Greater design completion prior to beginning construction.
Full consideration of global factors affecting project cost when doing initial cost estimates (labor availability, instability of commodity prices, nuclear supplier certification, etc.).
Understanding of nuclear-qualified supplier requirements and need for robust vendor commercial-grade dedication practices at all supplier tiers.

Understanding Cost, schedule and risk and quantifying to the extent practicable, and considered when making decisions for purchasing goods, understanding nuclear-qualified supplier requirements and the need for either vendor commercial-grade dedication or self-performed dedication.

"Trade Off Process" in Best Value continuum considered in most cases as the "basis for award", facilitating consideration of vendors' past performance and shop capacity, etc. for supplier selection.

Utilizing a cross-functional team, assembled prior to initiation of requisition, to decide Acquisition Strategy for a specific procurement (include all stake holders).

WTP (FPD/CONTRACTOR):

Best Practices:
Robust baseline change control systems, EVMS based
Comprehensive Risk and Opportunity Management Program – see Lessons Learned
Forward looking cost and schedule management systems that featured regular projections for both cost and schedule performance
Deployment of Integrated Project Teams (IPTs) with DOE participation
Fully integrated Engineering and Procurement tools/systems
Mature Procurement Engineering expertise supporting execution of commercial grade dedication strategies

WTP (FPD/CONTRACTOR): The award fee incentive structure could be more effective if it were more balanced in assessing the project for all work completed in the agreed upon plan as weighted in the plan. The award fee determination for CY 2009 appears to have been focused on a specific weighting criteria that was not in the plan. This resulted in an under-incentive for work scope completed that is vital to project progress, while focusing the value of the incentive on only those few, but important, issues that were not attained in the award period. The award fee is effective as a tool when utilized to incentivize all of the selected criteria.

WTP (FPD/CONTRACTOR): Did Prime Contractor have a subcontractor acquisition strategy?

Yes, in summary:

Subcontract for specialty services, i.e., concrete, special coatings, duct work, fire protection, etc.
Utilize lump sum/fix unit price to greatest possible extent
Utilize Best/Value continuum (LPTA/Trade-off) strategies to ensure best value goods/services
Established global supply chain consistent with Buy America Act restraints
Leverage commercial grade dedication as an alternative to procurement from nuclear qualified suppliers

WTP (FPD/CONTRACTOR): Fixed price provided best possible outcome, despite significant volume of schedule extension and design change. Cost-type subcontracts were less effective in controlling cost, due to frequent extensions to Project schedule.

WTP (FPD/CONTRACTOR): Cost-type subcontracts were less effective, due to frequent schedule extensions. Converting this work to discrete task-order basis with NTE values proved to be a more effective method.

WTP (FPD/CONTRACTOR): The Prime Contractor maintained an approved government purchasing system and acquired all required materials and equipment, approximately $1.7B in value. Given the close coupling of design with construction, procurement by the Prime Contractor was considered the only feasible approach. In general, this approach was effective, notwithstanding extensions to the project schedule and the rate of design changes, all of which significantly complicated the commercial aspects of each acquisition.

4.) MOX (SRS)

DOE POC: Clay Ramsey – FPD (803-952-4283) clay.ramsey@nnsa.srs.gov

Contractor POC: Casey Kenney / Sue King / Keith Wilkerson sckenney@moxproject.com

MOX (Contractor): The MOX Project is located within the Savannah River Site. All permanent personnel must be badged and pass through security each day. All vendors and support contractors must obtain temporary badges and clear security with every load of materials and equipment. Once on site, everyone must abide by the SRS rules and restrictions for all aspects of the work. Based upon the feedback we received from prospective vendors and subcontractors during the early stages of the MOX project, we believe that the site location significantly increased the total project cost and reduced the number of qualified bidders who participated in our competitive procurements. Another supporting data point was obtained from the former SRS M&O contractor's procurement department. It was reported that historically they found that the cost of goods and services typically increased by approximately 25%, for traditional services, materials and equipment, if the work was performed within the SRS secured area. As the US economy contracted over the last two years, this challenge appears to have subsided.

MOX (Contractor): The MOX Fuel Fabrication Facility (MFFF) is to be licensed and operate under the Nuclear Regulatory Commission (NRC) and, therefore, must follow the requirements of the NRC. However, constructing the facility within a DOE complex (SRS) introduced frequently competing and not necessarily compatible procedures and regulatory requirements. It is recommended that with regard to similar future projects, consideration be given to minimize the potential conflicts. One solution might be to name and empower an authority that could resolve any conflicts without placing the Contractor in the middle between two government entities.

MOX (Contractor): A delay in the authorization to start construction, augmented with vocal political opposition to the project, led to a strong reluctance by vendors and subcontractors to respond to the initial materials and equipment procurements. The result was reduced competition and in some cases, the procurements had to be modified or broken into smaller segments to attract any interest. For example with regard to Concrete placement, the original procurement was broken into three smaller components and re-issued to attract competition and even then there was only marginal interest in bidding.

MOX (Contractor): The contract originally prohibited "self performance" of the construction work by the Contractor. This proved to be an obstacle as the project advanced and the need for certain elements of the work to be performed by the Contractor became evident. Assuming that the Contractor is properly incentivized through the negotiated fee structure, the ability to self perform should be contractually maintained.

MOX (Contractor): Due to the anticipated congestion and interference between the multiple “fixed price” contractors working in relatively confined areas (rooms) within the plant, it was determined that certain aspects of the work should be self performed by the Prime in order to allow flexibility and thereby minimize delay and impact issues, especially with the fixed price subcontractors. The option for a Design / Build Contractor to self perform, subject to adequate justification and Client approval, should not be procluded within the Prime Contract.

MOX (Contractor): The fee structure for MFFF is quite complicated from the Contractor’s perspective. It includes an inter-related composition of Award Fee, Fixed Fee, Milestone Payments and Incentive Fee. In addition there are significant portions of the fee that are “provisional” and subject to “claw back”, which makes the recognition of fee for a publically traded company difficult.

MOX (Contractor): With regard to large nuclear construction projects, until such time that the Nuclear Construction Industry regains current and relevant experience to support NQA-1 type work, both DOE and their Contractors should plan on a greatly expanded Quality oversight role both at the project site and at the facilities of the suppliers and vendors.

MOX (Contractor): The MOX project is primarily an NQA-1 facility. With the start of construction in late 2007, it quickly became evident that very few of the subcontractors and vendors retained any significant NQA-1 capabilities. Even those companies that had significant historical experience, were in most cases found to be dated with regard to their ability to execute to NQA-1 standards. As a result, the MOX project greatly expanded its Quality Program and in most cases required the subcontractors and vendors to operate under the MOX Quality Program. In addition MOX Quality personnel were required to be stationed within the shops and fabrication facilities throughout the United States at significant additional cost.

5.) SPALLATION NEUTRON SOURCE (ORNL)

POC: Kurt Fisher – FPD (301-903-7412) kurt.fisher@hq.doe.gov

Contractor POC: Samuel P. McKenzie (865-241-8054) mckenziesp@oml.gov; sp5@aml.gov

EFCOG Lessons Learned and Best Practices
Vft, draft, 9/3/2010

Spallation Neutron Source (SNS) – note- The following was received in place of the questionnaire:

Lessons Learned - General

1. Significant cost reductions were identified and implemented after completion of the Title I estimate to reduce the project cost and deliver the project to the available funding.

Procurement

1. Develop a contracting strategy by the end of Title 1 (preliminary design) and develop construction and procurement packages consistent with the strategy.

2. Ensure that the project schedule allows enough time for review of solicitations before they are advertised.

3. Consider implementing an owner or CM furnished equipment program.

4. Consider a Directed Procurement program, where subcontractors utilize pre-qualified vendors at established prices.

5. Incentive programs for a CM should consider flowing the incentive program down to the construction subcontractors.

Design

1. Issue concurrent construction estimates with the design review submittals.

2. Building functions that are not compatible should not be combined into a common space.

3. On-board reviews at AE’s offices coupled with video conferencing and smart boards proved to be efficient and effective ways to manage design.

4. Include the AE in incentive programs.

Change Management

1. Unit rates for additions and deductions should be established as part of the base contact at the time of contact award.

2. Establish allowable profit and overhead percentages after proposals are opened but prior to award of contract.

3. Develop a process to notify all contractors when a Design Change Notice is issued which could impact their work.

4. Emphasize the need for timely estimates for changes and establish a suspension system to manage them.

Construction

1. Combine all underground utilities into one construction package and install them prior to the start of the G/C contracts.

2. Establish specific areas for suitable and unsuitable earthen materials and have a single contractor responsible for maintaining and operating these areas.

3. Establish an overall construction zone and keep contractors from homesteading in areas that will require future build-out.

4. Use large earthmoving equipment to perform as much building excavation as possible.

5. The technical specifications need to be tailored to each specific contract.

6. All work should be integrated into one large contract where there is high risk for coordination and delays.

7. Complete construction before turnover, if possible. If not, then a well-understood plan to phase construction with partial occupancy should be developed and approved.

8. Utilize pre-established welding programs from the construction unions.

Best Practices

1. The ORNL M&O competitively awarded an AE/CM contract regarding the conventional facilities of the project after completion of preliminary design and CD-2 approval.

2. ORNL assigned Task Leaders (TLs) to each major element of work that was responsible for managing design and construction of that work. The TLs developed systems requirement documents with each of the partner labs and these formed the basis of the design tasked orders issued to the AE. The AE developed basis of design documents to document their understanding of the requirements and then fixed priced Task Orders would be issued. The AE had on-site representations that interfaced with the project and Task Leaders. ORNL had a core group of design engineers who were responsible for the technical adequacy of design.

3. The AE//CM awarded all contracts (construction and procurement) and held the paper. All construction contracts were fixed price, with the exception of the technical equipment installation which was T&M. The AE/CM had an on-site core team that managed the work. The make-up of the core team was negotiated yearly.

4. An incentive plan was implemented on the project for the AE/CM. Construction contracts were awarded and completed at cost without any profit or fee awarded to the AE/CM. Annual and end-of-contract evaluations were performed, and the amount of profit earned was based on performance. The AE/CM had the ability to maximize their profit if the project saved dollars, completed on schedule, and the safety and environmental performance was excellent.

5. the CM instituted a wrap up insurance program for all construction, including work by the T&M contractor, which significantly reduced costs.

6.) CD-4 HIGHLY ENRICHED URANIUM MATERIALS FACILITY (Y12)

DOE POC: Dale Christenson – FPD (865-574-3964) christensode@yso.doe.gov

Contractor POC: C. Lynn Nolan (865-576-6764) nolancl1@y12.doe.gov

EFCOG Lessons Learned and Best Practices Vft, draft, 9/3/2010

CD-4 Highly Enriched Uranium Materials Facility (HEUMF) – note- The following was received in place of the questionnaire.

Lessons Learned - General

1. Key project staff assigned to the design and construction of a new non-reactor nuclear facility should have nuclear experience and appropriate training. Substantial planning and nuclear quality program development is necessary to guard against timely and expensive delays caused by quality problems.

2. Construction quality programs must consider the challenge of having many workers who have not been directly associated with nuclear construction work in the past. This needs to be addressed in the subcontractor selection process and training program for all project and craft personnel. Close attention needs to be given to the acquisition strategy for obtaining a nuclear construction subcontractor and key personnel.

3. To prevent significant cost growth, projects must minimize design changes after construction has started. Directed design changes must be thoroughly evaluated to assess the total impact on project cost and schedule. Three-D (3D) modeling should be strongly considered to avoid interferences during construction.

4. The accuracy of existing site information should be evaluated and uncertainty factored into the construction estimate and schedule.

5. Projects need to ensure subcontract language and project assessments address the potential for material price increases and include a corresponding appropriate amount of contingency in the project baseline.

6. Projects need to do early detailed planning to establish credible schedules, resources, budgets, and plans for a variety of key operational readiness and startup activities.

Best Practices

1. Mock-ups of key portions of the facility involving material handling in parallel with construction were constructed.

2. Nationally recognized geotechnical, seismic soil structure interaction, and concrete code specialists were utilized to address challenging issues related to the safety basis oversight.

3. Early site preparation work tasks were performed during the time when the facility design was being completed, which saved at least a full year in the construction schedule.

4. A collaborative approach was utilized in working with the nuclear safety oversight organization, which significantly improved relationships and the credibility of the project in the eyes of the stake holders.