EM-5.22 Lessons Learned Bulletin

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Lessons Learned in Planning and Designing Nuclear Facilities - INL

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Statement:

The Remote-Handled Low-Level Waste Disposal Facility (RWLLWDF) is being constructed to replace the Radioactive Waste Management Complex (RWMC) at the Idaho National Lab. This new facility will take over the modified waste activities of the RWMC which is beginning the closure process. The new RWLLWDF consists of a single HAZCAT 2 disposal facility with support buildings and utility infrastructure. Using a tailored CD-2/3 approach, the selected acquisition strategy was design-build. This strategy was selected because a similar onsite HAZCAT 2 facility had been constructed and the project was assessed as low risk.

Based on the project provided Lessons Learned CD- 3 submittal, this lessons learned will focus on the implementation of the design-build strategy and its relevancy to the performance of project planning and design. Benefits and recommendations identified by the project team have been provided in this bulletin.

Discussion:

Part of the INL nuclear mission is to manage waste from both INL site operations and Naval Reactor Facility activities. These low-level wastes have been disposed of at the Radioactive Waste Management Complex (RWMC) since 1952 and the facility is now undergoing the closure process. To address DOE Environmental Management and Nuclear Energy concerns, a programmatic analysis was performed and an alternative was approved to construct a new onsite disposal facility for remote-handled waste and ship contact-handled waste to Nevada National Security Site.

The RWLLWDF project scope consists of the construction of HAZCAT 2 facility containing concrete disposal vaults similar to the current system. The project also includes non-nuclear site support including utilities, security and safeguards, an administrative building, a maintenance building, support equipment, and the procedures and plans necessary to operate the facility.

A design-build acquisition strategy was selected by the project to execute the CD-2/3 process because a similar facility exists at the site and the project was assessed as low risk. To comply with the intent of DOE Order 413.3b, the project included a hold point within the schedule requiring Acquisition Executive approval of the final design to comply with CD-3 requirements before moving into construction on the vaults.

The CD-3 Lessons Learned submittal from the project identified some of their best practices and opportunities for improvement in their planning and design activities. Identified in this bulletin are a few of those lessons as they relate to the relevancy of a design-build strategy in project execution.

PLANNING

1. **Lesson Learned: Establish contract flexibility to accommodate potential delays in contract award schedule.**

Incorporated into the design-build contract were clauses, allowing for the provision to make pricing adjustments, for the impact of time on material prices, escalation, and forward pricing. Based on these clauses, the subcontractor would be allowed to make some pricing changes without the need of an additional bid submission and approval process. Shortly

after the bids had been received and submitted for CD-2/3 approval process, there was a lapse in funding appropriations for 3 years. The project concluded that had the clauses not been in place, project costs would have been impacted by approximately $1M and schedule by 9 months to account for administrative effort to make adjustments and obtain approvals. The inclusion of these clauses in the contract allowed the subcontractor to immediately begin design after notification of the project receiving CD2/3 approval.

2. **Lesson Learned: Make sure to clearly define the radiological and nuclear facility requirements, especially if using design-build strategy, since design-build requirements are normally more general in nature.**

Design-build strategies rely on project requirements being clearly defined in the Technical & Functional Requirements document in order to gain project design and construction efficiencies. A few of the nuclear safety performance specifications had not been clearly detailed in the technical documentation. This required additional effort to clarify the specifications causing an increase to project cost and a schedule delay. If the M&O had clear requirements included in their subcontract documents, the subcontractor could have avoided the increased cost and extended schedule in the final design.

3. **Lesson Learned: Ensure there is good documentation and understanding on the development and use of project Code of Record.**

The project team identified that at the time of the planning and design phase, definition and guidance for a project Code of Record was evolving to meet the DOE Order 413.3b requirements. This resulted in confusion regarding design supporting documents, and change control of design documents. Had a clearly developed and executed Code of Record been implemented, the project would not have incurred additional cost and delays due to correcting errors and omissions in design.

4. **Lesson Learned: Make sure that the contract establishes clear direction for handling questions, design changes, and construction changes and design-builder evaluation.**

The design-build contract did not identify a specific process for managing design changes. A design change process typically includes a means of asking and answering questions, providing review comments, assigning hierarchy for comment resolution, communicating requirement changes, etc. Without this defined process, the project used a modified construction change control process. The construction change control process is used for a means of communicating required changes to the methods of construction. By utilizing the construction change control process, they were not able to adequately communicate the information needed. This caused confusion and gave the appearance that the project underwent a significant number of changes, which is a sign of an unhealthy project. Had a formal design change control process been utilized, confusion with regard to design communication would have been reduced and the perceptions of the construction performance, through use of change control, would have been more accurate.

DESIGN

5. **Lesson Learned: Design-build team with site-specific experience is essential.**

The design-build subcontractor recognized they had limitations with their team's site specific knowledge for this particular project site. The design-build subcontractor bridged their lack in site specific expertise by hiring sub-tier contractors to fill their knowledge gaps. This allowed the subcontractor to understand DOE expectations and to take advantage of efficiencies in the design process. The design-build subcontractor also used in-house resources to develop project performance specifications. This simplified the design process, allowed the contractor to develop performance specifications which supported DOE specifications, and ensured DOE interests were protected.

6. **Lesson Learned: Use a requirements tracking database to ensure that all project requirements are captured and incorporated into the project design, construction, and operation.**

The project did not implement a requirements tracking system in the early phases of project design. This created inconsistency in execution of design. The requirements basis, to include evolutions, were not captured. For the final design phase of the project, a requirements tracking database was developed and implemented; however, this did not allow the project to capture full traceability of the design requirements. Had a requirements tracking database been implemented before the design process had been initiated, it would have "*ensured better consistency between project documents and better requirements traceability*".

7. **Lesson Learned: Unique, project-specific requirements that are not based in standard codes need to be clearly defined.**

The project technical & functional requirements document did not contain the detail needed to support non-standard design specifications. When standard design specifications are not used, the acceptance criteria must be defined so designers can understand what must be developed to meet the specification. Had the specification been defined such that the designer understood the acceptance criteria, the likelihood of meeting expectations would have been increased directly benefiting cost and schedule.

SUMMARY

The lessons of this project, when applied to additional projects, are anticipated to increase the effectiveness of project execution. To view the full report, please see the referenced report.

Recommended Actions:

The following recommendations are taken directly from the lessons learned document provided by the project team:

1. Establish contract flexibility to accommodate potential delays in contract award schedule (based on funding delays or other considerations).
2. Make sure to clearly define the radiological and nuclear facility requirements, especially if using design-build strategy, since design-build requirements are normally more general in nature.
3. Ensure that there is good documentation and understanding on the development and use of a project Code of Record.
4. Make sure that the contract establishes clear direction for handing questions, design changes, construction changes, and design-builder evaluations.
5. Selection of a Design-Build team with site-specific experience is essential.
6. Use a requirements tracking database to ensure all project requirements are captured and incorporated into project design, construction, and operation.
7. Unique, project specific requirements that are not based in standard code need to be clearly defined; especially where specialty expertise and/or modelling is required.

Critical Decision(s):	CD-0 to CD-3
Facility Type(s):	All
Work Functions(s):	Project/Program Management
Technical Discipline(s):	Contracting, Design

References:

1. Department of Energy Office of Science, “Remote-Handled Low-Level Waste Disposal Facility Idaho National Laboratory” *PARS II Lessons Learned PMLL-2016-INL-RHLLWDFP.001,* (March, 2016).