**Preparing a Lessons Learned Document**

The DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets* requires projects to develop Lessons Learned documentations within 90 days after the approvals of Critical Decision (CD)-3 (Approve Start of Construction) and CD-4 (Approve Start of Operations or Project Completion).

Although the Office of Science (SC) is exempt from the requirements of DOE O 413.3B, SC has agreed to Office of Engineering and Construction Management to develop Lessons Learned documents within 90 days after CD-3 and CD-4 are approved (see [Project Decision Matrix](http://science.energy.gov/~/media/opa/pdf/processes-and-procedures/Project_decision_matrix_11_2010_m.pdf)). Therefore, project Lessons Learned documents need to be developed for projects (regardless of the funding type) with Total Project Cost (TPC) of $10 million or greater. Exceptions to this requirement may be granted by the Office of Project Assessment in the event the duration between CD-3 and CD-4 is less than one year that developing multiple Lessons Learned documents would provide little value. In such an event, one document that captures lessons learned from all phases of the project should be sufficient.

The minimum requirement is to develop Lessons Learned documents is 90 days after the approval of the last CD-3 and last CD-4. However, lessons learned should be captured throughout the project. For projects with phased or split CDs, the minimum requirement is to have one document for all CD-3s and another for all CD-4s.

The purpose of this template is to provide guidance to the Federal Project Director (FPD) and the Integrated Project Team in producing a lessons learned document. This format is being adopted to allow more focused presentation of information at the summary level and at the same time, provide the flexibility for the project to discuss additional lessons learned if the project so chooses.

**The projects should discuss three major success lessons learned and three potential improvement lessons learned. However, for the “Other Lessons Learned” section, there are no limits on the number of items that can be included. It is suggested that these ‘Other’ lessons also be grouped as successes and potential improvements, and grouped by similar subject for easier reference.**

Please submit the CD-3 Lessons Learned document and the CD-4 Project Closeout Report (which includes the project lessons learned) to the Headquarters Program Manager and Office of Project Assessment within the 90-day time limitation.

Note: *Italicized text included in this document is provided as examples of what the section should contain. These are examples only.*

For post CD-3 Lessons Learned documentation, the lessons will generally focus on those activities that occurred prior to CD-3. Therefore, topics to consider include R&D, design, planning, management, the estimating process, the request for information/proposal process, the procurement process, funding/budgeting process, critical decision approval process, etc.

 The following sample report identifies the required sections of the Lessons Learned document. The *italicized text* included in this sample report is provided as examples of what the sections might contain and should be considered as examples only.

**Project Title:** *AAAA Project*

**Project Location:** *XXX Laboratory*

**Description of Project:** *The scope of the project is to design, fabricate, install, a state of the art laser splicer at the XXX Laboratory for studying …. The scope also includes testing and commissioning, and to demonstrate achievement of the key performance parameters by calculations, ….*

**Cost at CD-2 Approval:**

|  |  |  |  |
| --- | --- | --- | --- |
| **OPC ($M)** | **TEC ($M)** | **Contingency at CD-2 ($M)** | **TPC ($M)** |
| *$14.3M* | *$84.6M* | *$21.5M* | *$98.9M* |

**Schedule at CD-2 Approval:**

|  |  |  |
| --- | --- | --- |
| ***Critical Decision*** | ***Planned Date******(Month and Year)*** | ***Actual Date******(Month and Year)*** |
| *CD-0—Approve Mission Need* |  *May 2009*  | *May 2009* |
| *CD-1—Approve Alternative Selection & Cost Range* |  *February 2010*  | *March 2010* |
| *CD-2—Approve Performance Baseline* | *February 2011* | *February 2011* |
| *CD-3—Approve Start of Construction* | *March 2012* | *January 2012* |
| *CD-4—Project Complete* | *November 2015* |  |
| *Schedule contingency at CD-2:* | *10 Months* |
| *Schedule contingency at CD-3:* | *11 Months* |

**Funding Profile at CD-2 Approval:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***FY09*** | ***FY10*** | ***FY11*** | ***FY12*** | ***FY13*** | ***FY14*** | ***FY15*** | ***Total*** |
| ***OPC*** | *2.0* | *10.2* | *2.1* |  |  |  |  | *14.3* |
| ***TEC*** |  |  |  | *10.7* | *33.5* | *35.1* | *5.3* | *84.6* |
| ***TPC ($M)*** | ***2.0*** | ***10.2*** | ***2.1*** | ***10.7*** | ***33.5*** | ***35.1*** | ***5.3*** | ***98.9*** |

**Funding Profile Changes since CD-2, if there are changes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***FY09*** | ***FY10*** | ***FY11*** | ***FY12*** | ***FY13*** | ***FY14*** | ***FY15*** | ***Total*** |
| ***OPC*** | *3.0* | *12.5* | *3.5* |  |  |  |  | *19.0* |
| ***TEC*** |  |  |  | *15.0* | *30.5* | *30.1* | *4.3* | *79.9* |
| ***TPC ($M)*** | ***3.0*** | ***12.5*** | ***3.5*** | ***15.0*** | ***30.5*** | ***30.5*** | ***4.3*** | ***98.9*** |

**List three most significant “success” lessons for this project.**

| **Lessons Learned—Successes** | **Description, Impacts, and Solutions**  |
| --- | --- |
| *Have an experienced and diverse technical team*  | * *Developed detailed designs and specifications with few design changes. This resulted in considerable cost and schedule savings*
* *Better cost estimate developed due to more detailed design*
* *More readily overcome technical challenges due to experience and knowledge of team members.*
 |
| *“Bundled” procurements* | * *Cost savings from vendor due to economy of scale*
* *Less lab procurement resources (less travel, less personnel, less paperwork, etc.)were needed since quantity of procurements were smaller*
* *Improved or consistent quality of product since the source of the products was the same*

*Note: The disadvantage of the bundled procurement approach is the potential loss of innovation and competition from having multiple vendors.* |
| *Realistic identification of risks and management of risks* | * *Include in the risk team, all applicable areas of expertise when risk is being identified, categorized, mitigated, and planned*
* *Identifying all risks, regardless of the owner allows for better analysis, mitigation strategy and planning.*
* *Effectively use resources by focusing on risks with highest consequence.*
* *Identify multiple mitigation approach to risk mitigation if possible.*
* *Continuously perform and update the risk registry/analysis as project environment and conditions change.*
 |

**List three areas of potential improvement and how they have or might have impacted the project.**

| **Lessons Learned—Potential Improvements** | **Description, Impacts, and Solutions**  |
| --- | --- |
| *Co-location of personnel* | * *The project team had members and stakeholders who worked from home or were located in different states and even countries. This made project team interactions very difficult.*
* *After the identification of project personnel, there was minimal consideration on handling of geographical dispersion of the team members.*
* *Because of incompatibility with computer software, time differences, lack of proper communication systems, interactions between IPT members were very difficult and time consuming. This resulted in delayed decisions and increased travel costs.*
* *The project should have developed a project communication plan, which outlined protocols for meetings and attendance, training of personnel on virtual workplaces, comprehensive IPT contact information, IPT schedule, and other factors.*
* *In addition, for those team members who were not working remotely, they should have been co-located in the same building as much as possible as this makes communication much easier and faster.*
 |
| *Have agendas for meetings and document meeting minutes.* | * *In the initial phase of the project, frequent meetings between IPT, regulators, owners, and/or other stakeholders were conducted without formal procedures.*
* *The lack of structure, formality, and focus (especially in a academic environment) resulted in action items not being completed, same issues were repeatedly revisited without any closures, there were never time to discuss issues of importance since trivial issues were raised and took up the meeting time, and inappropriate people were sent to the meetings.*
* *Meetings should be formal as much as possible with agendas, documentation of meeting decisions, action items with due dates and responsibilities for action items assigned, invite specific personnel who can and has the authority to make decisions.*
 |
| *Understand and keep current on the requirements* | * *The project was not aware that the agency wide requirements on High-Performance and Sustainable Buildings were changed and thus did not incorporate the new requirements into the design. In addition, the funds included in the budget request did not include additional costs associated with implement the requirements.*
* *Expensive and time-consuming design changes were needed to incorporate latest requirements on sustainability and energy conservation.*
* *The program had to request additional funding to implement these requirements, which further delayed the project.*
 |

**List other lessons learned. It is suggested that these “Other” lessons also be grouped as successes and potential improvements, and grouped by similar subject for easier reference.**

| **Lessons Learned****Successes** | **Description, Impacts, and Solutions**  |
| --- | --- |
| *Use local firms for conducting independent cost reviews* | * *The project used two firms to perform independent cost estimates of various systems and facilities.*
* *Comparison of the ICEs and the bids received by vendors showed that the local company estimates were consistently more accurate that those estimated by a national company.*
* *The local firm was familiar with local economy, requirements, resource availability and other factors that made the estimate more realistic.*
* *The local firm also had a database based on local historical data that is more accurate.*
 |
| *Regularly Perform Bottom-up Estimate to Complete*  | * *A “bottoms-up” estimate to complete, not the use of the formula, should be performed at least annually project re-planning.*
* *This exercise was extremely useful in maintaining the integrity of the project plan, in focusing the attention of project stakeholders to potential project issues, and to the realization of productive external reviews.*
* *This process also provided an independent verification of completed work, and verified the accuracy of the monthly project tracking tools.*
 |
| *Fixed Price Contracts does not eliminate risks* | **•****•****•**….. |
|  | **•****•****•****•** |
| **Lessons Learned Improvements** | **Description, Impacts, and Solutions**  |
| *Minimize Phased CD Approach* | * *Having four phased CD-2s and the respective CD-3s were confusing and difficult to keep track of the phases.*
* *The phased approach also did not result in cost and schedule savings as expected since all requirements (reviews, documentations, ESAABs, etc.) were still applied for each phase as if each phase was a separate project.*
 |
|  | **•****•****•** |

**Submitted by:**

|  |  |
| --- | --- |
| Contractor Project Manager | Date |
| Federal Project Director | Date |

Lessons Learned documentation for CD-4 differs from CD-3 in that lessons learned for CD-4 is to be included as part of the Project Closeout Report. Because the Project Closeout Report already requests comparisons of major project parameters (scope, cost, schedule, etc.) at CD-2 and at CD-4, this data is not requested here.

For CD-4, please include those lessons that were learned between CD-3 and CD-4 phases and do not repeat what is already captured in the CD-3 lessons learned document. Topics that one might include in this document includes such activities related to safety, quality assurance, installation, change order process, management, funding, budgeting, continuing resolution planning, commissioning, key performance parameters, etc.

The following sample report identifies the required sections of the Lessons Learned document at the CD-4 stage. The *italicized text* included in this sample report is provided as examples of what the sections might contain and should be considered as examples only.

**Project Title:** *AAAA Project*

**Project Location:** *XXX Laboratory*

**Description of Project:** *The scope of the project is to design, fabricate, install, a state of the art laser splicer at the XXX Laboratory for studying …. The scope also includes testing and commissioning, and to demonstrate achievement of the key performance parameters by calculations,…*

**Project TPC:** *$98.8M*

**List three most significant “success” lessons for this project.**

| **Lessons Learned—Successes** | **Description, Impacts, and Solutions**  |
| --- | --- |
| *Have Commissioning Agent Involved in the Project as Soon as Possible*  | * *Commissioning agent (CxA) was hired at the start of design and was involved with the project until completion.*
* *The commissioning agent provided valuable recommendations to the design for improving facility capabilities. During construction, additional recommendations by the CxA on latest materials available and installation techniques resulted in large cost and time saved to the project.*
* *The commissioning agent also regularly communicated with the project stakeholders (future building occupants) to enhance the building capabilities early in the project.*
* *Commissioning process was very smooth and relatively easy because of extensive involvement by the CxA throughout the project.*
 |
| *Plan for Scope Enhancement* | * *The project, since the approval of CD-1, identified, developed, and continually updated a prioritized list of scope enhancements in case extra contingency were to become available.*
* *The list was very detailed and included information such as cost of the enhancement item, importance of item to the project, specification developed, identify the duration to install, fabricate, or purchase the item, the decision date on when to accept or reject the item to be part of the project scope, impacts to other activities, item owner, and other information.*
* *When additional contingency did become available three months prior to project completion date, most of the items on the list were included in the project seamlessly.*
 |
| *Prototyping* | * *Early prototyping of factory processes was very beneficial, especially later in the project by providing useful information during fabrication and installation.*
* *First, thorough prototyping helped to achieve good design and good estimates of cost and schedule.*
* *Prototyping identified technical and manufacturing issues and challenges that could be planned for the actual production.*
* *Prototyping allowed better understanding and planning for where bottlenecks are in the work process.*
* *Minimized the time and cost of modifications to the mainstream effort, due to understanding gain from prototyping.*
 |

**List three areas of potential improvement and how they have or might have impacted the project.**

| **Lessons Learned—Potential Improvements** | **Description, Impacts, and Solutions**  |
| --- | --- |
| *Safety Improvements* | * *Most likely, if the incentive period is too long it becomes more difficult for the goals (i.e., zero accidents for one-year period) to be met. The contractor will not be motivated if the likelihood of getting the incentive is improbable.*
* *Shorten the evaluation period since this has a greater chance for the contractor to receive the incentive award and thus be more motivated.*
* *Accidents will happen regardless of plans, training, goals, incentives, etc. Minimize the impacts of accidents by planning ahead—having readily visible and accessible safety stations, training for first aid and wound care, donning proper PPEs, etc.*
* *Wrong incentives may lead to not reporting of safety incidents instead of real safety improvements.*
 |
| *Improve QA and testing of components prior to installation* | * *The site has general policy for QA and testing of components; however, the project specific QA and testing procedures were inconsistent and too general. As a result, some components had QA inspections and/or testing while many were not.*
* *Because some components were effectively checked out and properly set in the lab prior to installation, then problems are not found until commissioning.*
* *This lead to uninstallation of components, check and repair of components, and reinstallation of the components. All of these activities were made more difficult and complex by the accessibility and in a limited space environment.*
* *This resulted in significant schedule and cost contingency for the project.*
 |
| *Improve understand funding/budgeting constraints and allowances*  | * *With a few minor changes, the project should have been defined as a Major Item of Equipment instead of a Lin-Item as MIEs funds provide more flexibility with moving the funds around without having to reprogram*
* *The project should have used the long-lead procurement option to accelerate the project.*
* *Because the CD-2 was approved too late in the fiscal year, the request for construction funds from OMB was delayed. This resulted in loss of opportunity to accelerate the schedule by ~4 months.*
* *In a continuing resolution, the*
 |

**List other lessons learned. It is suggested that these ‘Other’ lessons also be grouped as successes and potential improvements, and grouped by similar subject for easier reference.**

| **Lessons Learned** | **Description, Impacts, and Solutions**  |
| --- | --- |
| *Assign User Representative* | * *A strong single representative (customer single point of contact) with technical and scientific background was appointed to represent the lab and was given the authority to make decisions. The representative was responsible for controlling the numerous scientific opinions and requests.*
* *This approach minimizes design changes and reduced duplication of change requests.*
 |
| *Fixed Price Contracts does not eliminate risks* |  |
|  |  |
|  |  |
| **Lessons Learned Improvements** | **Description, Impacts, and Solutions**  |
| *Metric vs. English Units* | * *For foreign vendors, need to ensure proper units are used to prevent misunderstanding, and to minimize resources needed to convert differing units.*
 |
| *Reviews* | * *The project should have input into the review committee by ensuring that the committee has relevant experience and is knowledgeable about the project.*
* *Reviews are not just a one-way street. The project can benefit by using the review team to independently assess the project and to use the knowledge of the review to share lessons learned, identify risks, or to solicit solutions to issues.*
 |
|  |  |

Lessons learned should be captured continuously throughout all phases of the project. When documenting lessons learned, the information should be focused and succinct. Below is a form that the project can use to capture and record lessons learned information. It is based on the A3 form that Toyota Motor Corporation uses to solve problems. The **use of this form is not mandatory** as the sites or contractors may have their own process for capturing lessons learned.

|  |
| --- |
| **IDENTIFY AND PLAN** |
| **Problem and Importance**—This section defines the problem and why change is needed. |
| *Procurement actions are taking longer than planned and affecting the project schedule by consuming too much schedule contingency.* |
| **Current Situation**—Graphs, numbers, and facts that clearly depicts the current condition. |
| *The procurement cycle from solicitation development to the award of contracts are taking on average approximately 6 months. Project need to reduce the process time for a successful project.* |
| **Root Cause Analysis**—What are the root causes of the problem? |
| Why? *Technical requirements for components are too rigid. Specs provided by the various CAMs were inconsistent thus leading to the need for specific procurement for each component.* Why*? Several RFP periods extended due to no responses from vendors.*Why? *Staff available does not have appropriate skills.*Why? *There is not enough funding or time to train or hire additional staff.*Root Cause: *There are too many contracts for the number of personnel available. Acquisition staff is overwhelmed.*Root Cause*: Proposals are too difficult to fulfill by potential vendors. Need to relax specifications to allow more competition.* |
| **Goals and Target**—What specific outcomes are desired? |
| *Reduce the average procurement cycle of future procurements to 4 months.* |
| **IMPLEMENT AND VERIFY** |
| **Countermeasures**—Proposed corrective action to address each root cause. |
| Reduce the number of procurements  |
| **Implementation Plan**—Plan to implement the corrective actions. |
|

|  |  |  |
| --- | --- | --- |
| ***Action*** | ***Owner*** | ***Due Date*** |
| *Conduct a meeting with all the CAMs to ensure the requirements are consistent and relax the standards.* | *Project Manager, CAMs* | *Xx/xx/xxxx* |
| *Conduct market analysis of potential vendors* | *Joe Smith* | *Xx/xx/xxxx* |
| *Project Manager work with procurement head to reduce the number solicitations by 1/3 through combining procurements*  | *Project Manager* | *Xx/xx/xxxx* |
| *Standardize solicitations to reduce contracting durations.* | *Procurement Head* | *Xx/xx/xxxx* |

 |
| **Effect Confirmation/Verification**—Verify that the corrective actions are working and that goals and targets are being met. |
| The number of procurements has been reduced by 20% due to “bundling” so far. Standardization of procurement documents and templates also has reduced the RFP development duration by 25%. |
| **Follow-up Actions**—Any follow-up actions that may be needed. |
| *Project Manager to keep track of procurement cycle durations on a monthly basis and find additional efficiencies.* |