The Deputy Secretary of Energy
Washington, DC 20585

2003-004184

March 31, 2003

MEMORANDUM FOR ROBERT G. CARD
UNDER SECRETARY, ENERGY, SCIENCE
AND ENVIRONMENT

LINTON BROOKS
ACTING ADMINISTRATOR, NATIONAL NUCLEAR
SECURITY ADMINISTRATION

JAMES T. CAMPBELL
ACTING DIRECTOR, OFFICE OF MANAGEMENT,
BUDGET AND EVALUATION/CFO

FROM: KYLE E. MCSLARROW

SUBJECT: Project Management and the Project Management Manual

ACTION: You are hereby directed to implement the attached manual titled "Project Management for the Acquisition of Capital Assets". While the manual is available for immediate use and adoption, it will become mandatory on October 1, 2003. Within 180 days of this date, all field elements shall have prepared an implementation plan for the manual and within 120 days of this date all major field elements should have been briefed on the manual by the PSOs, or their delegies, in concert with the OECM.

BACKGROUND: This manual should be viewed in the context of our broader efforts to improve management at DOE consistent with the President's management agenda. While this manual only applies to "capital asset projects" at this time, offices are encouraged to use the management principles contained in this manual, in a broad context across their program activities.

A primary role that DOE plays within the federal government that distinguishes us from many other agencies, is the delivery of large, complex projects. As shown in the table below, this role and requirement is common for nearly all of our line organizations. The effective and predictable delivery of large projects must be, and perceived to be, a core organizational competency for DOE and its employees to grow and prosper.

Organization	Project Example	Project Value
NA-20 (NN)	MOX Fuel Fabrication Facility	$2 billion
NA-10 (DP)	National Ignition Facility	$2.3 billion
EM	Hanford vitrification plant	$5.8 billion
RW	Yucca Mountain licensing and initial construction	$7 billion
EERE	5-year FreedomCAR hydrogen program	$1.7 billion
FE	FutureGEN clean coal plant	$1 billion
NE	Isotope Production Facility	$23 million
Office of Transmission	Path 15 California transmission upgrade	$400 million
SC	Spallation Neutron Source	$1.4 billion

While DOE has successfully delivered the vast majority of its projects, we must increase our success rate and our management of those projects where complications occur. Companies in the business of project management, such as the engineering and construction industry and the aerospace and defense industries, tell us that achieving project management success is a very difficult and never ending challenge for them. We should not expect to spend any less effort on this than the best of our private sector peers. Further, what makes DOE's projects among the most exciting in the world is that they are frequently one of a kind using complex systems and technologies in a first time application. Obviously, this requires even more planning and expectations management at the inception of a project and skillful management of its delivery.

Management Principles

Role of this Manual. The purpose of this manual is to improve the implementation of DOE Order 413.3. It was not intended to impose new requirements that are not already Department policy or are contained in the Order. However, the manual does contain changes and clarifications to existing requirements. I have directed OMBE to publish revisions to DOE O 413.3, Program and Project Management for the Acquisition of Capital Assets, to make it consistent with the manual. Pending the update of DOE O 413.3, the manual takes precedence where there is a conflict between the processes, procedures and approval levels contained in the manual and those in the Order and other project management policy statements, including the Deputy Secretary memorandum concerning Project Acquisition Plans and Critical Decisions, dated November 15, 2001 and the Director, Office of Management, Budget and Evaluation (OMBE) memorandum concerning Mission Need Justification and Project Acquisition Plans dated February 14, 2002.

Furthermore, because this manual does not impart additional requirements, projects with approved Critical Decisions before the implementation date of this manual, are not required to revise documentation supporting those Critical Decisions based upon the requirements identified in this manual.

This manual, in and of itself, is but a building block on our way to improved project and general management. It will not be complete without adequate organizational and training implementation, attention to other key management issues such as safety, and many other features of our management systems.

Because we are planning on using project management fundamentals as a key part of our broader management agenda, DOE managers are encouraged to comment on ways to improve the manual. While the requirements of the order and manual remain in effect, it is anticipated that these improvements may warrant a revision by the end of this year.

It is recognized that senior management needs to be involved in guiding the field through the manual and explaining its concepts and principals. It is for this reason that PSOs are being instructed to complete implementation training at the field sites within 120 days of the manual's issue date.

The Federal Project Director. Among the most significant new concepts in the attached manual is the retitling of the chief line federal official from "Project Manager" to "Project Director". This is more than a name change: it reflects the principles of line management and accountability that must go hand in hand with good management. For the overwhelming majority of DOE projects, there are fundamentally different roles between the federal Project Director and the contractor Project Manager. Please review the roles and responsibilities in the manual carefully.

To paraphrase the roles and responsibilities, the federal Project Director should view themselves as investors, strategists, developers and contract (rather than contractor) managers. If they find themselves involved in the day-to-day management of the project, it would be an indication that they have either stepped out of their role or there has been a major acquisition failure on the project.

The contractor Project Manager is responsible for the day to day management of the project and delivering the means, methods and resources to meet the contract end point requirements and the intermediate requirements that the project director determined where value added and necessary to achieve project success.

Federal project directors will be required to have training and certification in accordance with departmental standards. We are targeting full implementation of this requirement (where all project directors must be certified) over the next two years. This will be described in the project management career development program that we expect to release within the next few months.

Tailoring. The manual recognizes that varying emphasis is appropriate to match the scale, risk and complexity of the projects. Thus, while we expect the same principles to be adhered to with all projects, the level of effort spent on them will be vastly different between a small routine administrative building and say a pit production facility. Additionally, it is recognized that some projects, which have high risk and a low initial opportunity cost, make methodical upfront planning a clear desirable strategy.

This is as contrasted to others like some EM projects that may have huge ongoing standby costs. In those cases, taking more planning risk for the sake of schedule acceleration may produce a much lower overall cost for the government.

Controlling costs is an essential element in performance baseline stability. However, for projects such as environmental restoration and remediation, we may be unsatisfied with the initial cost and schedule and are expecting continuous improvement in reducing the baseline. In this case, baseline stability is not necessarily a good indicator of success. This may also be true of long-term projects where we are expecting rapid technological advancements during the life of the project.

Compatibility with Contractor Systems. DOE endeavors to hire the very best project management contractors and, therefore, we should try to avoid creating unnecessary entry barriers to the best who may not yet be working for us. Consequently, it is intended to allow the contractor to use their standard systems where they can be accommodated while meeting the intent of the manual and other DOE requirements. For example, while we expect our contractors to use earned value reporting that meets recognized national standards, it is also expected that there will be acceptable variations within the broader national standard among our contractor community.

Maintaining the status quo in our project performance is not acceptable. While this manual is a step in the right direction, its publication should not be viewed as an end point, but rather a key element in our overall effort to continually improve the way the Department plans and executes our projects.

DOE M 413.3-1

Approved: 3-28-03

This directive was reviewed and certified as current and necessary by James T. Campbell, Acting Director, Office of Management, Budget and Evaluation/Acting Chief Financial Officer, 3-28-2003

PROJECT MANAGEMENT FOR THE ACQUISITION OF CAPITAL ASSETS

U.S. DEPARTMENT OF ENERGY
Office of Management, Budget and Evaluation

DISTRIBUTION:
All Departmental Elements

INITIATED BY:
Office of Engineering and Construction Management

PROJECT MANAGEMENT FOR THE ACQUISITION OF CAPITAL ASSETS

1. PURPOSE. The purpose of this Manual is to provide requirements and guidance to Department of Energy (DOE) employees, including National Nuclear Security Administration (NNSA) employees on the planning and acquisition of capital assets. The Manual establishes the framework and context for implementing DOE P 413.1, *Program and Project Management for the Planning, Programming, Budgeting, and Acquisition of Capital Assets*; DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets* and Office of Management and Budget Circulars: A-11, Part 7, *Planning, Budgeting, and Acquisition of Capital Assets*; A-109, *Major Systems Acquisitions*; A-123, *Management Accountability and Control*; A-127, *Financial Management Systems*; and A-130, *Management of Federal Information Resources*.

2. APPLICABILITY. The requirements identified in this Manual are mandatory for all capital asset acquisitions, including NNSA projects, having an expected fabrication, implementation, or construction cost greater than $5 million. This Manual applies to Federal Program Managers, Project Directors and Acquisition Executives as they propose, plan, manage, and oversee projects for DOE. While all requirements are to be addressed, the approach to meeting the requirements should be tailored consistent with the complexity, visibility, cost, safety, and risk of the project. All program and projects shall comply with all applicable laws, regulations, Executive orders, and DOE directives.

3. REFERENCES. DOE P 413.1, *Program and Project Management for the Planning, Programming, Budgeting, and Acquisition of Capital Assets*, and DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets*.

4. CONTACT. Questions concerning this Manual should be addressed to the Office of Engineering and Construction Management at 202-586-1784.

BY ORDER OF THE SECRETARY OF ENERGY:

KYLE E. McSLARROW
Deputy Secretary

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FOREWORD

This Manual is founded upon the key principles of line management accountability, effective up-front planning, management of risk, accurate performance measurement, and communication with stakeholders. Although the Department depends upon outstanding companies, universities and other partners for the day-to-day project execution and management, the overall execution, management and performance of DOE's mission remain the ultimate responsibility of the Federal officials of this Department.

A significant change introduced in this Manual is the change in position titles from Federal *Project Managers* to *Project Directors*. This change is being made to emphasize the important distinction between the roles filled by the Federal and contractor management staffs. The title Project Director is intended to convey a higher level of Federal and contractor interface than is conveyed by the title project manager.

It is in keeping with the Department's philosophy that the role of Federal officials is to develop the overall strategy; establish requirements and performance expectations; manage the contract, not the contractor; monitor and assess performance; and proactively anticipate and resolve issues that impact project success. While the overall project is executed under the "direction" of the Federal staff, it is the contractor that is actually "managing" the daily execution. Establishing the right balance between the Federal and contractor roles is a key goal and is critical to improving DOE's performance executing projects.

Project Directors are responsible for the planning, programming, budgeting, and acquisition of capital assets. One of the principal outcomes in exercising this responsibility is the delivery of projects on schedule, within budget, with the required performance capability, and compliant with quality, environmental, safety, and health standards. This Manual identifies the DOE requirements related to the acquisition of capital assets and presents a common framework for implementing the requirements. The intent of this manual is not to impose additional requirements, but rather place existing requirements in the proper context. The target audience of this Manual includes Federal Project Directors, Program Managers, Acquisition Executives, and others involved in the DOE capital asset acquisition process.

This Manual has two sections. Section I, Requirements, provides an overview of DOE's project management system, identifies the requirements that shall be followed by all capital asset acquisitions greater than $5 million, and includes the roles and responsibilities of the key individuals responsible for successful project execution. Section II, Guidance, provides amplifying information on the implementation of requirements. Because of the diversity of projects within the Department, there is no single, uniform construct or set of activities that can apply to all projects. Consequently, Section I directs what must be done and Section II provides guidance on how it can be done.

No requirement in this Manual shall be implemented in a manner that would conflict with the provisions of the National Nuclear Security Administration Act.

Section I

Requirements

Section I provides an overview of DOE's project management system, identifies the requirements that shall be followed for all capital asset acquisitions greater than $5 million, and includes the roles and responsibilities of the key individuals responsible for successful project execution.

Section I directs what must be done.

CHAPTER 1. ACQUISITION MANAGEMENT SYSTEM OVERVIEW

1.1 INTRODUCTION AND KEY TERMS

This chapter provides an overview of the Department of Energy (DOE) Acquisition Management System and introduces the various phases of a project life cycle. The relationship between projects and programs is discussed and the capital asset planning, programming, and budgeting process is summarized.

Key terms used in this chapter include the following.

- Secretarial Acquisition Executive
- Acquisition Executive
- Critical Decision
- Major System project
- Mission Need Statement
- Other Project Costs
- Project Engineering and Design funds
- Performance Baseline
- Total Project Cost
- Total Estimated Cost

1.2 ACQUISITION MANAGEMENT SYSTEM

The Acquisition Management System establishes a management process to translate user needs and technological opportunities into reliable and sustainable facilities, systems, and assets that provide the required mission capability. The system is organized by phases and "Critical Decisions." The Deputy Secretary serves as the Secretarial Acquisition Executive (SAE) for the Department. As the SAE, he promulgates Department-wide policy and direction, and personally makes Critical Decisions for Major System projects. Designated Acquisition Executives make Critical Decisions for non-Major System projects. The phases represent a logical maturing of broadly stated mission needs into well-defined technical, system, safety, and quality requirements; and ultimately into operationally effective, suitable, and affordable facilities, systems, and other end products. Figure 1-1 illustrates the overall Acquisition Management System.

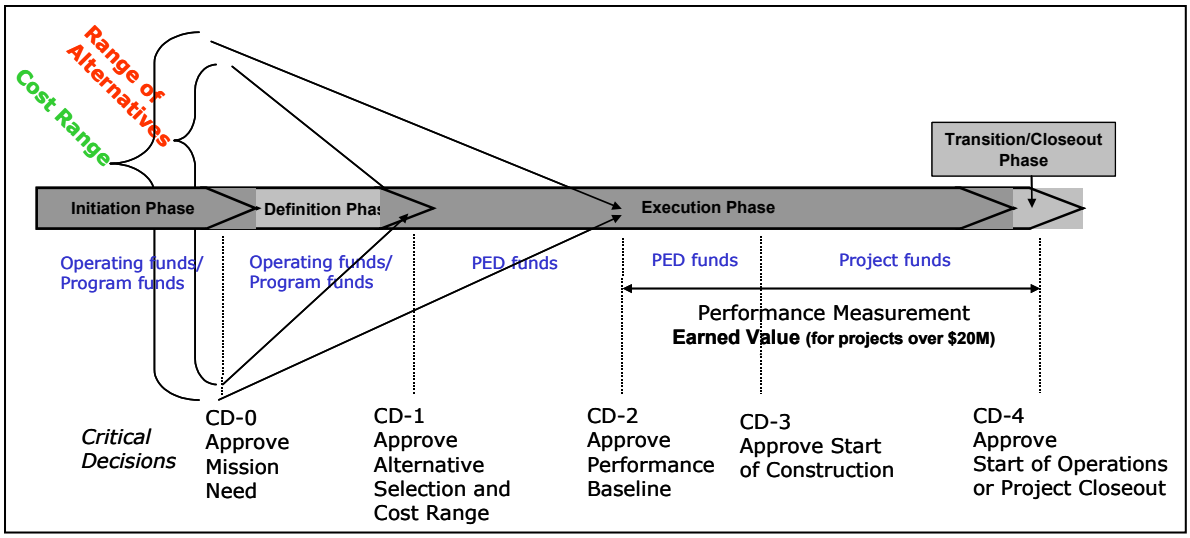


Figure 1-1. DOE Acquisition Management System.

1.2.1 Initiation Phase

During the Initiation Phase, identified user needs are analyzed for consistency with the Department's strategic plan, Congressional direction, administration initiatives, and political and legal issues. One outcome of the analysis could be a determination that a user need exists which cannot be met through other than material means. This outcome leads to the development and approval of a Mission Need Statement that discusses the user need in terms of required capability, not equipment, facilities or other specific products. This is the first Critical Decision of the acquisition process—Approve Mission Need. The information developed during this phase also provides the basis for the Project Engineering and Design budget request when preliminary design activities are planned.

1.2.2 Definition Phase

Upon approval of mission need, the project enters the Definition Phase, where alternative concepts based on user requirements, risks, costs, and other constraints are analyzed to arrive at a recommended alternative. This is accomplished using systems engineering and other techniques and tools, such as alternatives analysis and value management, to ensure the recommended alternative provides the essential functions and capability at the optimum life-cycle cost, consistent with required performance, scope, schedule, and cost. During this phase, more detailed planning is accomplished which further defines the required capability. These efforts include conceptual design, requirements definition, risk analysis and management planning, and development of the acquisition strategy. The products produced by this planning provide the detail necessary to develop a rough order of magnitude or range for the project cost and schedule. The recommended alternative, when sufficiently defined and analyzed, is presented to the SAE or designated Acquisition Executive for review and approval (Critical Decision 1—Approve Alternative Selection and Cost Range).

1.2.3 Execution Phase

Upon completing the Definition Phase, the project enters the Execution Phase where the focus is on further defining the selected alternative, developing preliminary designs, arriving at a high confidence baseline, and generating the complete project execution plan; all of which support a request for funds in the DOE budget. This part of the Execution Phase culminates with the development of the Performance Baseline, which is presented to the SAE or designated AE for approval (Critical Decision-2—Approve Performance Baseline). The Performance Baseline documents the Department's commitment to Congress to execute the project at a specific cost and schedule threshold and achieve a specific performance capability. After Critical Decision-2, engineering and design continue until the project is ready for construction or implementation. Before major budget and other resources for construction or implementation are committed, an executability review is performed as a precursor to Critical Decision-3—Approve Start of Construction.

1.2.4 Transition/Closeout Phase

The Transition/Closeout Phase is when the project is approaching completion and has progressed into formal transition, which generally includes final testing, inspection, and documentation, as the project is prepared for operation, long-term care, or closeout. Once implementation is substantially complete, transition to operations begins. The transition point will depend on the type of project. A project may seek approval to transition to operations (Critical Decision-4—Approve Start of Operations or Project Closeout) when required capability is implemented and functioning, operational resources are in place, have been trained and are able to perform their continuing responsibilities.

1.3 PROGRAM AND PROJECT RELATIONSHIP

To execute its missions, the Department organizes related and interdependent mission elements into programs. Programs may be composed of ongoing operational activities with no set duration periods, acquisition activities with specific durations, or combined acquisition and operational programs. An operational activity is typically identified by multiyear activities that use relatively straight-line funding over an extended period of time and work planning that is normally accomplished for each year. Acquisition projects are structured to deliver defined capabilities within fixed timeframes and costs, and tend to have funding plans that peak in the middle of the project with a corresponding slope as the project progresses to completion. Planning for acquisition projects normally is multi-year from start to completion. While programs and projects may have many similar attributes, it is not the intent of this Manual to define requirements for operational program management. Rather the Manual defines requirements and the context for acquiring capital assets, improving or restoring existing capital assets, and demolishing and/or disposing of capital assets, regardless of the terms used to define the effort.

1.3.1 Programs

A program is an organized set of activities directed toward a common purpose, objective, or goal undertaken or proposed by an Agency to carry out assigned responsibilities. The term is generic and may be applied to many types of activities. Acquisition programs are programs whose purpose is to deliver a capability in response to a specific mission need. Acquisition programs may comprise multiple acquisition projects and other activities necessary to meet the mission need. This Manual does not apply to operational, research, or other programs whose end objectives are not new capital assets or the improvement, restoration, demolition and/or disposal of existing capital assets.

1.3.2 Projects

Projects are specific undertakings that support a program mission; are undertaken to create a product, facility or system; and have defined beginning and endpoints. DOE projects range from relatively simple vertical construction of a building to developing, designing, and implementing large, complex, one-of-a-kind systems made up of multiple subsystems that require the integration of multiple locations and systems into a unified whole. Projects also include developing and installing software systems, remediation and disposition of contaminated sites and facilities, and restoration or modernization of existing facilities and infrastructure. Most projects are characterized as a collected set of overlapping, interdependent activities. For example, design may be ongoing in one project area while in another project area items may be in construction or testing.

The following terms apply to classifying, characterizing, and reporting.

- *Plant.* A complete and usable capability for the purpose of producing an output or product.
- *Facility Construction.* A project whose end objective is a structure designed for general purpose use.
- *System.* A complete and usable capability for scientific and technical purposes including research and development.
- *Environmental Restoration.* A project whose purpose is the environmental restoration of real property.
- *Disposition.* A project whose purpose is the demolishing and/or disposition of capital assets.

- *Infrastructure Restoration or Modernization* A project whose purpose is to repair, upgrade, improve, or rehabilitate existing assets.

- *Information Technology* A complete and usable capability for the purpose of creating, storing, and processing information.

DOE projects are classified as either Major System projects or Other Projects. Major System projects include those with a total cost of $400 million or more and other projects specifically designated as a Major System by the Deputy Secretary.

1.4 PLANNING, PROGRAMMING, BUDGETING, AND EVALUATION PROCESS

Acquisition of capital assets is an integral part of the Department's Planning, Programming, Budgeting, and Evaluation (PPBE) process. The PPBE process provides a systematic framework for prioritizing program needs, allocating resources, measuring performance and delivering results. The PPBE process is cyclical and its products are updated each fiscal year. The Acquisition Management System supports the PPBE process by providing project planning, budget justification, and project performance information.

DOE's Budget Formulation Handbook provides detailed explanations and formats for preparing budgets and identifying funding for specific types of projects and project phases.

CHAPTER 2. REQUIREMENTS

2.1 INTRODUCTION AND KEY TERMS

The Acquisition Management System uses a cascaded set of requirements, direction, guidance, and practices that minimize mandatory requirements and provide balance and effectiveness while protecting the public trust.

Requirements are contained in DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets.* The requirements are also addressed in this Manual and are consolidated in this chapter. The requirements, which are identified using **bold** text, create the framework within which the Department acquires capital assets. Supplementary information and guidance on the content and format of the various requirements is contained in Section II of this Manual.

Key terms used in this chapter include the following.

- Acquisition Strategy
- Conceptual Design Report
- Earned Value Management System
- External Independent Review
- Independent Project Review
- Mission Need Statement
- Performance Baseline
- Project Assessment And Reporting System
- Project Execution Plan
- Risk Management Plan
- Total Estimated Cost
- Total Project Cost

2.2 REQUIREMENTS AND AUTHORITIES

The requirements identified in this chapter shall be implemented by all projects with Total Project Costs greater than $5 million.

Requirements are organized to correspond with the project phases described in Chapter 1 and the associated Critical Decisions. These requirements are intended to provide a solid foundation for effective project management, yet are adaptable to the wide variety of projects that support the Department's diverse programs, customers, and users.

Roles, responsibilities, and authorities drive the implementation of the Acquisition Management System. The authority to make decisions and the responsibilities for executing the decisions are aligned according to the complexity, criticality and cost parameters for all projects. This authority is by appointment and is designated or delegated as directed in this Manual.

Roles, responsibilities, authorities, and approval thresholds in this Manual shall be complied with and delegated only as provided.

2.2.1 Critical Decisions

Critical Decisions identify the exit points from one phase of the project and entry to the succeeding phase. As previously stated, each decision marks an increase in commitment of resources and is based on a successful and complete preceding phase. At the most fundamental level, the decisions confirm the following.

- There is a need which cannot be met through nonmaterial means.
- The selected alternative and approach is the right solution.
- A definitive cost, scope, and schedule baseline has been developed.
- The project is ready for implementation.
- The project is ready for turnover or transition to operations.

There is no defined or directed period of time between decisions. Many projects are able to quickly proceed through the early decision points because of the lack of complexity or the presence of constraints that reduce available alternatives, or the absence of significant technology and developmental requirements. In these cases, decisions may be made simultaneously. The thresholds and authorities for decisions are shown in Table 2-1.

All projects with a Total Project Cost greater than $5 million shall use the defined Critical Decisions.

- **Critical Decision-0, Approve Mission Need**
- **Critical Decision-1, Approve Alternative Selection and Cost Range**
- **Critical Decision-2, Approve Performance Baseline**
- **Critical Decision-3, Approve Start of Construction**
- **Critical Decision-4, Approve Start of Operations or Project Closeout**

Table 2-1 Critical Decision Authority Levels

Critical Decision Authority	Total Project Cost	
Secretarial Acquisition Executive	**> $400M or < $400M when designated by SAE**	
Under Secretary/ NNSA Administrator (Acquisition Executive)	**< $400M**	**Acquisition Executive Delegation Allowed*** To Program Secretarial Officers or Deputy Administrators/Associate Administrators for NNSA
Program Secretarial Officers or Deputy Administrators for NNSA	**< $100M**	To a Program Manager or field organization manager
	< $20M	To a direct reporting subordinate of the field organization manager

*Critical Decision -0, Approve Mission Need, may not be delegated below Program Secretarial Officer or NNSA Deputy Administrator level. The Under Secretary/Administrator NNSA and the Deputy Secretary must be formally notified of all CD-0, Approve Mission Need, and CD-4, Approve Start of Operations or Project Closeout, decisions for non-major system projects $100M and over.

Critical Decision-0, Approve Mission Need

A Mission Need Statement documents a mission requirement that the Department cannot meet through nonmaterial means. It is the primary document supporting Critical Decision-0—Approve Mission Need. Mission needs are identified in terms of capability, not in terms of equipment, facility or other solutions. Mission needs must support DOE's Strategic Plan and lower level plans for each program. Approval of the mission need is the authorization to develop alternative concepts and functional requirements. **A Mission Need Statement shall be developed for projects having a Total Project Cost greater than $5 million, and shall be reviewed by the Office of Management, Budget and Evaluation (OMBE) prior to approval.** For other than NNSA projects, the Program Secretarial Officer may request a waiver to the OMBE review for projects under $100 million. The waiver request shall be submitted to the Director, Office of Program Analysis and Evaluation, at least 60 days in advance of Critical Decision-0. The request must stipulate that the Program Secretarial Officer has reviewed all mission need requirements and must include a brief statement as to why the OMBE review should be waived. The Director, Office of Program Analysis and Evaluation, will notify the requesting official in writing of the decision on the waiver request. For NNSA Projects under $100 million, the above waiver process

applies except that the NNSA Administrator may grant waivers to the OMBE review after seeking the advice of OMBE. If the Administrator rejects the advice of OMBE, he shall seek the approval of the Deputy Secretary prior to granting the waiver.

Mission Need Statements are approved by the Program Secretarial Officers (PSOs)/Deputy Administrators. Delegation below this level is not allowed. Approval of the Mission Need Statement document does not represent approval of Critical Decision-0 for Major System projects, and other projects where the Acquisition Executive authority lies above the PSO/Deputy Administrator level. In those cases the key elements of the Mission Need Statement should be presented to the Secretarial Acquisition Executive/Acquisition Executive as part of the decision making process.

Critical Decision-0, Approve Mission Need, formally establishes a project and initiates a requirement for project status reporting. The DOE Project Assessment and Reporting System (PARS) provides a web-based system to report project status. **Starting at Critical Decision-0, project status shall be reported monthly utilizing the PARS, and the Acquisition Executive shall begin conducting quarterly progress reviews**. **The Office of Engineering and Construction Management (OECM) shall be invited to all quarterly reviews.** The requirement for quarterly reviews cannot be delegated below the Acquisition Executive for non-major system projects. The SAE may delegate quarterly reviews for major system projects to the Under Secretary/National Nuclear Security Administration (NNSA) Administrator.

Critical Decision-1, Approve Alternative Selection and Cost Range

Key activities that take place leading up to Critical Decision-1 include alternative and requirements analysis, conceptual design, development of an acquisition strategy, evaluation of project risks, hazards analysis, systems engineering, and value management.

Requirements related to Critical Decision-1 are as follows.

- **Requirements that form the basis for the design and engineering phase of the project shall be clearly documented.**

- **A Conceptual Design Report shall be developed that includes a clear and concise description of the alternatives analyzed, the basis for the alternative selected, how the alternative meets the approved mission need, the functions/requirements that define the alternative, and demonstrates the capability for success.**

- **An Acquisition Strategy that accounts for risks and mitigation strategies shall be developed for each project, and shall be reviewed by OMBE prior to approval by the designated Program Secretarial Officer or NNSA Deputy/Associate Administrator.** For other than NNSA projects, the Program Secretarial Officer may request a waiver to the OMBE review for projects under $100 million. The waiver request shall be submitted to the Director, Office of Engineering and Construction Management, at least 60 days in advance of Critical Decision-1. The request must stipulate that the Program Secretarial Officer has reviewed all acquisition strategy requirements and must include a brief statement as to why the OMBE review should be

waived. The Director, Office of Engineering and Construction Management, will notify the requesting official in writing of the decision on the waiver request. For NNSA projects under $100 million, the above waiver process applies except that the NNSA Administrator may grant waivers to the OMBE review after seeking the advice of OMBE. If the Administrator rejects the advice of OMBE, he shall seek the approval of the Deputy Secretary prior to granting the waiver.

- **All projects shall include a value management assessment.** The assessment shall be conducted as part of the conceptual design process to include making a determination of whether a formal value engineering study is required. Any decision to not perform a formal value engineering study shall be documented in the Project Execution Plan.

At the conclusion of the concept exploration process, the alternative selected as best solution to a mission need is presented for approval. While a range of costs, schedule, and performance bound the solution/alternative, there is no committed or approved baseline until the design matures—when estimates and schedules can be defined with an acceptable degree of certainty. The approval package must include a description of alternatives considered, trade studies, development efforts, and testing requirements. Approval of the alternative selection and cost range authorizes the beginning of preliminary design work.

Critical Decision-2, Approve Performance Baseline

The Performance Baseline defines the cost, schedule, performance, and scope commitment to which the Department will execute the project. The Performance Baseline is generally the result of a mature design; detailed, resource loaded schedules cost estimate for the entire project; and the defined performance parameters and scope. Approval of the Performance Baseline marks the beginning of performance tracking. It also authorizes submission of the total project budget request. Key activities that take place leading up to the approval include preliminary design; development of key performance, scope and schedule parameters; risk assessment; establishment of a performance measurement system; identification of project interfaces; and development of the Project Execution Plan. Design may proceed throughout this phase of the project. However, if the project scope or cost has changed significantly from that which was identified in the conceptual design, the Acquisition Executive should weigh the risk of continuing the design against the potential need to revise the project scope or re-examine the alternatives available to satisfy the mission need.

Requirements related to Critical Decision-2 include the following.

- **A Project Execution Plan shall be developed for each project that includes an accurate reflection of how the project is to be accomplished, resource requirements, technical considerations, risk mamagement, and roles and responsibilities.**

- **All projects shall establish a Performance Baseline at Critical Decision-2 that includes key performance parameters to clearly establish the capabilities being acquired and the schedule and total cost to acquire the capabiltity.**

- **The Performance Baseline shall account for risks and mitigation strategies and be adjusted for both durations and costs providing a realistic, achievable Performance Baseline commitment.**

- **OMBE will validate all Performance Baselines prior to approval. An External Independent Review shall be performed by OMBE to support the baseline validation.**

- **Every project shall have a functioning performance management system, no later than final Performance Baseline approval.**

- **For projects with a total projected cost greater than $20M, the performance management system shall be an Earned Value Management System that is certified as compliant with ANSI/EIA-748.** For projects executed under time-and-material contracts, firm fixed-price contracts, or level of effort support contracts, the Acquisition Executive may approve an alternative performance management system. The alternative performance management system must be described in the Project Execution Plan.

- **Starting at Critical Decision-2, project performance shall be reported monthly using PARS.**

Critical Decision-3, Approve Start of Construction

Approve Start of Construction provides authorization to complete all procurement and construction and/or implementation activities and the planning, implementing, and completion of all acceptance and turnover activities. This authorizes the project to commit all the resources necessary, within the funds provided, to execute the project. **An Executability External Independent Review will be conducted by OMBE prior to Critical Decision-3 for all Major System projects.**

Critical Decision-4, Approve Start of Operations or Project Closeout

Approve Start of Operations or Project Closeout is approval to transition or turnover to operations. It is predicated on the readiness of the operators to operate and maintain the system, facility, or capability. Transition and turnover does not necessarily terminate all project activity. It marks a point at which the operations organization assumes responsibility for the operation and maintenance. **All projects shall have a project transition/closeout plan that clearly defines the basis for attaining initial operating capability, full operating capability, or project closeout, as applicable.** The closeout/transition plan is normally included in the Project Execution Plan.

2.3 RISK MANAGEMENT

Effective risk management is an essential element of every project. The DOE risk management concept is based on the principles that risk management must be analytical, forward-looking, structured, informative, and continuous. Risk assessments should be performed as early as possible in the project life cycle and should identify critical technical, performance, schedule,

and cost risks. Once risks are identified, sound risk mitigation strategies and actions should be developed and documented. As a project progresses, new information improves additional insight into risk areas and allows the continuous refinement of the risk mitigation strategies. Risk mitigation plans should not use contingency as the only mitigation strategy. They should be primarily focused on reduction and prevention risks, not on the resultant cost should a specific risk occur. Effective risk management requires involvement of the entire project team. The project team may be augmented, if necessary, by outside experts knowledgeable in critical risk areas such as technology, design, and cost, to assist in risk identification and assessment. In addition, the risk management process must address every element of the project throughout all phases of the project. It is important that all stakeholders participate in the assessment process so that an acceptable balance between cost, schedule, performance, and risk can be reached. A close relationship between the Federal project management staff and the contractor promotes a better understanding of program risks and assists in developing and executing the management efforts. **Risk management shall be performed on all projects throughout the project life cycle. A formal Risk Management Plan is required for all Major System projects and for other projects having significant risk as determined by the Acquisition Executive. For projects where a formal Risk Management Plan is not required, the plan for managing and mitigating risks must be addressed in the Project Execution Plan.**

2.4 CHANGE CONTROL

Project changes can be classified into two broad categories. First are those changes that directly impact the Performance Baseline (Total Project Cost, schedule, scope and performance parameters). Second are those that occur within the Performance Baseline, such as changes to project subelement costs and milestones. Changes to the Performance Baseline require senior management attention and involvement. Changes within the Performance Baseline are routinely accomplished during the development process as the design, engineering, execution or construction and risk management efforts continue. Establishing a formal change control process permits all changes to be managed to integrate the cost, schedule, and technical parameters that are affected by each change. Change control approval thresholds should be developed in a tiered manner, from the SAE to the PSO/Deputy Administrator level down to the Project Director and the contractor, commensurate with the size and significance of the proposed change. **Project changes shall be identified, controlled, and managed through a traceable, documented change control process that is defined in the Project Execution Plan.** Congressional notification is required whenever a project change results in a 25 percent increase in the Total Estimated Cost in accordance with applicable statutes. Project changes caused by Congressional action, such as a funding shortfall or the addition of new requirements, shall be called directed changes. Directed changes shall follow the change control process and shall be approved by the appropriate Acquisition Executive.

2.5 PERFORMANCE BASELINE DEVIATIONS

A Performance Baseline deviation occurs when the current approved performance, scope, schedule, or cost parameters cannot be met. The Project Director must ensure management is promptly notified whenever the project performance indicates the likelihood of a Performance Baseline deviation. **When a deviation occurs, the SAE is to be notified and a specific**

determination must be made by the approval authority identified below whether to terminate the project or establish a new Performance Baseline. New Performance Baselines established as a result of a deviation requiring specific approval by the SAE are identified in Table 2-2. The Under Secretary and NNSA Administrator are the approval authority for Performance Baseline changes below SAE approval level. The Under Secretary and NNSA Administrator may delegate their approval authority to PSOs/Deputy Administrators, but the authority may not be delegated below that level. These approval levels shall be incorporated into the change control process for each project. New Performance Baselines to be established as a result of a deviation must be validated by OMBE. A copy of approved documentation supporting establishment of new Performance Baselines shall be provided to OMBE.

Table 2-2. Performance Baseline Change Authority

Performance Baseline Changes Requiring Approval by the Secretarial Acquisition Executive	
Major System and Non-Major System Projects	
Technical	Any change in scope and/or performance that affects mission need requirements or is not in conformance with current approved Project Data Sheet.
Schedule	6 month or greater increase (cumulative) in the original project completion date.
Cost	Increase in excess of $25M or 25% (cumulative) of the original cost baseline.

2.6 TAILORING

Tailoring is an essential element of the acquisition process and shall be applied to all projects although the greatest amount of tailoring will typically be applied to smaller, low-risk, and noncomplex projects. The methodology and approach used to meet the various requirements listed in this chapter should to be tailored appropriately in consideration of the complexity, cost, and risks of each acquisition project. Requirements must be addressed to the extent necessary and practical for managing the project. Tailoring may involve consolidation of decisions, documentation, substituting equivalent documents, concurrency of processes, "bundling" similar projects together, or creating a portfolio of projects to facilitate a single Critical Decision, Acquisition Strategy, etc., for the entire group of projects. Tailoring may also include adjusting the scope of Independent Project Reviews and External Independent Reviews to match the size, risk, and complexity of projects being reviewed. Tailoring does not imply the omission of essential elements in the acquisition process, such as risk analysis or critical decisions, which are necessary for all projects, or other processes that are appropriate to a specific project's requirements or conditions. Project Directors are accountable for ensuring project management requirements are tailored utilizing a systematic process that incorporates a cycle of reviews and comments by the Integrated Project Team members with final approval of the project requirements by the Acquisition Executive.

2.7 OTHER REQUIREMENTS

This Manual is not the sole source for all requirements and guidance that applies to the acquisition of capital assets. Other DOE Orders and Manuals, especially regarding radiological design, engineering, safety and security; environmental and other laws; regulations, including the Federal Acquisition Regulation; and local and State laws all influence, guide, and direct the acquisition of capital assets. Identification, implementation, and compliance with other requirements are the responsibility of line management, including the Project Director and the Integrated Project Team. Indeed, one of the primary purposes of the Integrated Project Team is to ensure that the breadth of requirements is included in the project scope.

CHAPTER 3. ROLES AND RESPONSIBILITIES

3.1 INTRODUCTION AND KEY TERMS

The key roles and responsibilities for the requirements and functions defined in this Manual are described in this chapter. Although Federal Project Directors are essential to successfully executing DOE capital asset projects, various other positions and organizations perform key functions and provide critical support during a project's life cycle.

The Department uses the Integrated Project Team approach for the acquisition of capital assets. The Integrated Project Team for each project is a formal team with the Project Director serving as the team leader. Integrated Project Team membership should comprise representatives from all the business and technical disciplines, such as legal, financial, contracting, safety, environmental health, and others, necessary for successful execution of the project.

The Department executes its acquisition projects through contractors. Accordingly, DOE contractors perform many of the requirements necessary to effectively carry out the Project Director responsibilities. Contractor position titles such as "Project Manager," "Program Manager" and others may be identical to government position titles.

The identical use of any position titles by a contractor does not convey to the contractor the responsibility or requirements contained in this Manual. Contractual requirements will be stated in terms of the specific contract, not by position title.

Authority for the acquisition of capital assets begins with the Deputy Secretary of Energy, as the SAE who is the Department's senior executive for the Acquisition Management System. The Deputy Secretary may delegate Acquisition Executive authority for non-Major Systems to an Under Secretary or to the NNSA Administrator, both of whom may redelegate Acquisition Executive authority, as listed in Table 2-1.

Following are the key terms used in this chapter.

- Acquisition Executive
- Energy Systems Acquisition Advisory Board
- Integrated Project Team
- Project Director
- Secretarial Acquisition Executive

3.2 KEY ROLES AND RESPONSIBILITIES

This Manual emphasizes three themes regarding roles and responsibilities that are necessary to consistently achieve defined project objectives:

- strengthening line management accountability for project management results;
- clearly defining the roles and responsibilities of the Federal project management team relative to the contractor project management team; and
- developing effective Integrated Project Teams to assist the Federal Project Director in planning, programming, budgeting, and acquisition of capital assets.

Line managers will be responsible for successfully developing, executing, and managing projects within the approved Performance Baseline. Delegation of authority from one line manager to a lower level line manager shall be made consistent with DOE delegation authorities and the qualifications of the lower level line manager. Although the authority and responsibility for decision making may be delegated to a lower level manger, the senior manager remains accountable for the decisions made by the subordinate managers. Key roles and responsibilities of line managers are described below.

3.2.1 Deputy Secretary

The Deputy Secretary, as SAE, reports directly to the Secretary and has line accountability for all program/project acquisitions. Additionally, the SAE serves as the Chief Operating Officer for DOE. The Deputy Secretary—

- serves as the senior manager responsible and accountable for all project acquisitions;
- exercises decision-making authority, including Critical Decisions for all Major System projects;
- maintains a list of special interest projects and ensures senior executive level quarterly reviews are conducted for those projects;
- approves disposition of projects and Performance Baseline changes at SAE approval level following Performance Baseline deviations;
- serves as the chair for the Energy Systems Acquisition Advisory Board (ESAAB);
- approves site selection for facilities for new sites; and
- addresses and resolves issues that crosscut between NNSA and Energy, Science and Environment programs.

3.2.2 Under Secretary for Energy, Science and Environment and the Administrator for NNSA

- Receive Acquisition Executive authority from the SAE.

- Delegate, as appropriate, Acquisition Executive authority.
- Exercise decision-making authority, including Critical Decisions when functioning as Acquisition Executives.
- Serve as chairs and appoint members for acquisition advisory boards.
- Approve disposition of projects and Performance Baseline changes below SAE approval level following Performance Baseline deviations (may be delegated to PSOs/Deputy Administrators).
- Maintain lists of special interest projects and ensure senior executive level quarterly reviewss are conducted for those projects.
- Establishe Project Management Support Offices or delegate responsibility to PSOs/Deputy Administrators/Associate Administrators.
- Address and resolve issues that crosscut between programs reporting to them.

3.2.3 Program Secretarial Officers and Deputy Administrators/Associate Administrators for NNSA

- Have line accountability for applicable program and capital asset project execution and implementation of policy.
- Execute accountability for site-wide environment, safety, and health and safeguards and security.
- Approve Mission Need Statement documents and Acquisition Strategy documents for all capital asset projects (cannot be delegated).
- Approve disposition of projects and Performance Baseline changes below SAE approval level following Performance Baseline deviations, if delegated the authority (cannot be further delegated).
- Exercise decision-making authority, including Critical Decisions when functioning as Acquisition Executive (see paragraph 3.2.7).
- Responsible for Critical Decision-0, Approve Mission Need, for all projects $100 million and below (cannot be delegated).
- Delegate as appropriate, Acquisition Executive functions.
- Approve selection of the Project Director for projects no later than Critical Decision-1.
- Serve as chairs, appoint members for acquisition advisory boards, and direct independent reviews.

- Establish project management support offices when responsibility is delegeted or directed by Under Secretary/Administrator NNSA.

3.2.4 Project Management Support Offices (when established)

- Provide independent oversight and report directly to the Under Secretary, NNSA Administrator, or PSO, as appropriate.
- Serve as the Secretariat for the PSO/NNSA-level Advisory Board functions.
- Coordinate quarterly performance reports.
- Coordinate with other DOE organizations and offices, including OECM, to ensure effective and consistent implementation project management policies and directives.
- Provide assistance and oversight to line project management organizations.
- Analyze project management execution issues.
- Actively assist senior management on issues related to project management perfomance, including implementation of corrective actions.

Program Managers, Heads of Field Organizations and Others Reporting at this Level

- Direct initial project planning and execution roles for projects assigned by the Acquisition Executive.
- Initiate definition of mission need based on input from sites, laboratories, and Program Offices.
- Establish Integrated Project Teams no later than Critical Decision-0.
- Oversee development of project definition, technical scope, and budget to support mission need.
- Initiate development of the acquisition strategy before Critical Decision-1 (during the period of time preceding designation of the Project Director).
- Perform functions as Acquisition Executive when so delegated (see paragraph 3.2.7).
- Develop project performance measures, and monitor and evaluate project performance throughout the project's life cycle.
- Allocate resources throughout the program.
- Oversee the project line management organization.

3.2.6 Project Directors

- Are responsible for project management activities for one or more discrete projects under their cognizance.
- Are accountable for planning, implementing, and completing a project using a systems engineering approach.
- Develop and implement the Acquisition Strategy and the Project Execution Plan.
- Define project objectives and technical, schedule, and cost scopes.
- Ensure the design, construction, environmental, safety, health, and quality efforts performed by various contractors are in accordance with the contract, public law, regulations, and Executive Orders.
- Ensure timely, reliable, and accurate integration of contractor performance data into the project's scheduling, accounting, and performance measurement systems.
- Evaluate and verify reported progress; make projections of progress and identify trends.
- Serve as the single point of contact between Federal and contractor staff for all matters relating to the project and its performance.
- Serve as the Contracting Officer's Technical Representative, as appointed.
- Develop, staff, and issue the Integrated Project Team charter when not accomplished by the program manager.
- Lead the Integrated Project Team.
- As delegated by site/field organization manager or program manager, approve changes in accordance with the approved change control process.

3.2.7 Acquisition Executives

Acquisition Executive authority should be delegated to a level commensurate with the size and complexity of the project and in accordance with DOE policies and orders. Some key acquisition management decisions and approvals are reserved for specific management levels and cannot be delegated. The roles and responsibilities presented below are for illustrative purposes. Each designated Acquisition Executive should be guided by the specific limits of his/her delegated authority.

- Approve Critical Decisions (Critical Decision-1, Approve Mission Need cannot be delegated below PSO/Deputy Administrator level).
- Approve key project documentation with the exception of the Mission Need Statement and the Acquisition Strategies, which are approved by the PSO/Deputy Administrator.

- Appoint and chair acquisition advisory boards to provide advice and recommendations on key project decisions.
- Approve the selection of Project Directors.
- Monitor the effectiveness of Project Directors and support staff.
- Approve project changes in accordance with change control levels contained in Project Execution Plans.
- Conduct monthly and quarterly project performance reviews.

3.2.8 Departmental Staff and Support Offices

Departmental Staff and Support Offices develop policy and related implementing guidance, perform review functions, and provide advice and recommendations to Department leadership. These offices report directly to the Office of the Secretary and are responsible for administrative, financial, health and safety, international, safeguards and security, intelligence, counterintelligence, performance assurance, information and other services that cut across all organizational elements and all programs. Key roles and responsibilities of these offices regarding the acquisition of capital assets are described below.

Office of the Chief Information Officer

- Establishes and maintains Department-wide guidance for Information Technology investment management projects, including Information Technology hardware, software and application, and capital assets.
- Develops supporting policy, requirements, and guidance for Information Technology investments and projects.
- Provides Information Technology investment management process assistance to Program Office, field elements, and contractor locations, as requested.
- Regularly collects process performance measurement information, and prepares a summary report on the status and performance of Information Technology investment management processes.

Office of Engineering and Construction Management within the Office of Management, Budget and Evaluation

- Serves as DOE's principal point of contact relating to project management.
- Develops policy, requirements, and guidance for the acquisition of capital assets.
- Assists in the planning, programming, budgeting, and execution process for the acquisition of capital assets in coordination with Program Secretarial Offices and project management support offices.

- Supports the Office of the Secretary, the SAE, the NNSA Administrator, and the Program Assistant Secretarial Office in the Critical Decision process and oversight of the acquisition management process.
- Serves as Secretariat for the Energy Systems Acquisition Advisory Board functions.
- Serves as an acquisition advisory board member for non-Major System projects over $20 million.
- Manages the Project Manager Career Development Program.
- Manages the Earned Value Management System certification process.
- Provides an independent assessment and analysis of project planning, execution and performance.
- Reviews acquisition strategies for all capital asset projects.
- Coordinates review of Mission Need Statement with OMBE Office of Program Analysis and Evaluation.
- Maintains a corporate project reporting capability.
- Establishs, maintains, and executes a corporate independent review capability.
- Validates the Performance Baseline for all capital asset projects to permit inclusion in the budget.

3.3 FEDERAL PROJECT DIRECTORS AND CONTRACTOR PROJECT MANAGERS

Successful performance of DOE projects depends on professional and effective project management by the Project Directors as well as the Contract Project Managers. Roles and responsibilities of the Project Director team must be clearly defined relative to the contractor management team. Table 3-1 provides a side-by-side comparison to help illustrate the key roles and responsibilities of the Project Directors and Contractor Project Managers.

3.4 INTEGRATED PROJECT TEAMS

The Integrated Project Team is an essential element of the Department's acquisition process and will be utilized during all phases of a project life cycle. An Integrated Project Team is a team of professionals representing diverse disciplines with the specific knowledge, skills, and abilities necessary to support the successful execution of projects. Project Directors, contracting officers, safety and quality, legal, and personnel in technical disciplines compose the membership of typical Integrated Project Teams. As Integrated Project Team leader, the Project Director is responsible for—

- preparing and maintaining a team charter and operating guidance,
- providing the team with broad program guidance and delegating project decision-making authority appropriate to the member's competency and limitations of authority,

Table 3-1. Federal Project Director and Contractor Project Manager Roles and Responsibilities

FEDERAL PROJECT DIRECTOR AND CONTRACTOR PROJECT MANAGERS *	
Project Director	**Contractor Project Manager**
• Federal official responsible and accountable for overall success of the project	• Contractor official responsible and accountable for successful execution of contractor's project scope of work
• Charters and leads the Integrated Project Team	• Key member of the Integrated Project Team • Chairs the contractor's Integrated Project Team
• Tailors DOE project management requirements to the project	• Supports Federal Project Director in implementing DOE project management process
• Ensures timely completion and quality of required project documentation	• Provides input on project documents and develops and maintains contractor project documentation
• Assesses contractor project performance versus contract requirements	• Defines the contractor project organization • Manages the day-to-day project execution activities • Implements contractor performance measurement system
• Ensures quality and timely completion of project documentation and other deliverables	• Delivers project deliverables as defined in the contract on time and within budget
• Proactively identifies and ensures timely resolution of critical issues within Federal control that impact project performance - strives to remove any barriers to project success • Integrates and manages the timely delivery of Government reviews, approvals, property, services, and information	• Proactively identifies and ensures timely resolution of critical issues within contractor's control which impact project performance - strives to remove any barriers to project success
• Assesses and reports project performance to DOE management	• Communicates accurate and reliable project status and performance issues to DOE management
• Monitors contractor's risk management efforts	• Identifies and manages project risks
• Manages DOE project contingency funds	• Manages contractor's management reserve funds

[a*] The table is not intended to be a comprehensive listing of all roles and responsibilities nor is it meant to impart a contractual obligation on DOE contractors.

- requesting and allocating budget,
- maintaining an environment that rewards team success,
- appointing appropriate leads within the team,
- keeping the team and upper management informed, and
- scheduling and holding regular meetings.

Team members will be representative of all competencies that influence or affect the execution of the project. Integrated Project Teams can be composed of both DOE Federal staff and contractors. However, participation of contractors in inherently governmental functions, such as development of the Acquisition Strategy and other procurement-related decisions, must be in full compliance with all applicable policy and regulations. As a project progresses from Initiation to Transition/Closeout, the Integrated Project Team membership will change to incorporate the necessary skills and expertise required. This flexibility allows the Project Director to adapt the Integrated Project Team to meet the project needs as the project progresses. Team membership may be either full time or part time depending on the scope and complexity of the project. The team members are responsible to the team leadership for—

- ownership of the Integrated Project Team's charter, goals, and objectives;
- supporting project performance, scope, schedule, cost, and safety and quality objectives;
- identifying and meeting commitments; and
- maintaining communication with their respective departments/organizations, the Project Director, and other Integrated Project Team members.

3.4.1 Integrated Project Team Roles and Responsibilities

- Supports the Project Director.
- Develops a project contracting strategy.
- Ensures all project interfaces are identified, completely defined, and managed to completion.
- Identifies and defines appropriate and adequate project technical scope, schedule and cost parameters.
- Performs monthly reviews and assessments of project performance and status against established performance parameters, baselines, milestones, and deliverables.
- Plans and participates in project reviews, audits, and appraisals as necessary.

- Reviews all Critical Decision packages for completeness and recommends approval/disapproval.
- Reviews and comments on project deliverables (e.g., drawings, specifications, procurement, and construction packages).
- Reviews change requests (as appropriate) and supportschange control boards as requested.
- Plans and participates in operational readiness reviews.
- Supports the preparation, review, and approval of project completion and closeout documentation.

3.5 ENERGY SYSTEMS ACQUISITION ADVISORY BOARD

The Energy Systems Acquisition Advisory Board advises the SAE on Critical Decisions related to Major System projects, site selection, and Performance Baseline deviation disposition.

- *Membership.* Energy Systems Acquisition Advisory Board membership includes the SAE as Chair, the Under Secretary and NNSA Administrator; the DOE General Counsel; the Director of OMBE/Chief Financial Officer; the Director of OECM; the Assistant Secretary for Environment, Safety and Health; the Assistant Secretary for Environmental Management; the Deputy Administrator for Defense Programs; the Director for Office of Science; and the Director of Procurement and Assistance Management. The Deputy Secretary may designate other Program Secretarial Officers or functional staff as board members, as needed.
- *ESAAB Secretariat.* The Energy Systems Acquisition Advisory Board Secretariat resides in OECM and provides administrative and analytical support and recommendations to the Energy Systems Acquisition Advisory Board.

3.5.1 Non-Major System Project Advisory Boards

The designated Acquisition Executive will appoint an advisory board to provide advice and recommendations on actions for projects that are not designated as Major Systems. The designated Acquisition Executive is the chair of the advisory board. The advisory board replicates and conducts identical functions to those performed by the corporate Energy Systems Acquisition Advisory Board. Members may be selected from within the Acquisition Executive's organization. However, at least one member from an office not under that Acquisition Executive will be designated as a contributing representative. OECM will provide a member of each advisory board for projects having a Total Project Cost between $20M and $400M. For projects between $5M and $20M, OECM is not a board member but should be invited to attend the advisory board meetings. The implementing documentation and composition of the advisory boards, along with the agenda and minutes of each meeting will be provided to OECM.

Section II

Guidance

Because of the diversity of projects within the Department, there is no single, uniform construct or set of activities that can apply to all projects; therefore, Section II provides amplifying information on the implementation of requirements.

CHAPTER 4. INITIATION PHASE

4.1 INTRODUCTION

The Initiation Phase begins prior to the identification of a capital asset need. During this phase, the program identifies the performance gap between its current and required capabilities and capacities to achieve the goals articulated in its strategic plan. A mission need is the translation of this gap into functional requirements that cannot be met through other than material means. The outcome of this phase leads to the development and Critical Decision 0, Approve Mission Need of the acquisition process. Mission need requirements should not be defined in equipment, facility, or other specific end item, but in terms of the mission, purpose, capability, schedule and cost goals, and operating constraints. Mission needs are independent of a particular solution, e.g., capital asset, technological solution, or physical end item. This approach allows the program the flexibility to evaluate a variety of solutions with an open mind and not limit potential solutions defining the mission need and requirements too narrowly.

4.2 STRATEGIC PLANNING

Each program is responsible for developing a strategic plan which defines its long-range goals. The plan also identifies the peformance goals that lead to the attainment of its strategic goals. One outcome of the entire strategic planning process is the identification of gaps between the current performance and the required performance.

4.3 PRESENT PERFORMANCE ASSESSMENT

To successfully attain the goals contained in the strategic plan, the programs must develop strategies and related resource requirements through a comprehensive assessement of current and required capacities and capabilities of the program and the Department. The first step in the Initiation Phase is the assessment of the existing capabilities and capacities within the Department to meet the performance requirements. This assessment should include the functionality, the life-cycle cost, and the capacity of the program to accommodate additional requirements. This performance assessment is a key element in determining when there is a requirement for a capital asset. It establishes the basis for a mission need.

4.4 PERFORMANCE REQUIREMENTS ANALYSIS

Once the basis for the existing capability has been established, the program should identify the gap in terms of performance. Performance definitions establish what an asset must achieve, not what it is. An office building provides a working environment for a number of people and has the ability to support various functions. Performance definitions do not identify size, shape, systems, equipment, land, or other attributes that give an asset shape and form. Performance definitions must allow a comparison of required functionality with current functionality so that the gap that the proposed asset has to fill can be determined.

4.5 ALTERNATIVES TO CAPITAL ASSETS

With the completion of the performance analysis, the program must analyze the alternatives available to achieve the required performance. A primary question to be answered is whether these functions need to be performed by the Federal Government. Programs should not construe contracting for the function as performance by someone other than the Federal Government. When the Federal Government retains the ultimate responsibility and accountability for executing the function, the Federal Government is performing the function.

In some cases, privatizing the function may be a viable alternative to performance by the Federal Government. However, when the Federal Government remains the only customer, retains some responsibility, or provides some support, the function is not wholly privatized.

Alternatives to acquiring a new asset should also include a determination of whether another Federal, State, or local entity or the private sector can better perform the function. This determination should include consideration of not-for-profits, universities and even responsibility sharing arrangements.

Finally, consideration of a need for a new asset must include consideration of improvements in efficiency, cost reductions, commercial technology, and process re-engineering as possible alternatives to a new asset. The cost versus benefit of providing a new asset, modifying an existing asset or other alternatives must be an inherent component of the analysis.

4.6 MISSION NEED STATEMENT

The culmination of this planning and analysis is the identification of a mission need that cannot be met through other than material means. The decision to pursue a capital asset acquisition is the first of several key decisions in the acquisition process. The need documented in the Mission Need Statement summarizes the analytical process used by the program to evaluate and define the need.

Mission need describes shortfalls or performance gaps between the current and the required state. Because the mission is defined in terms of capability rather than assets or the end project, there is not necessarily a one-to-one correlation between mission need and a specific acquisition of a capital asset. A mission need may result in multiple projects.

The statement of the mission need is defined in terms of mission, goals, and general capabilities—not in terms of equipment or system specific performance characteristics. That information will be provided during the Definition Phase of the project.

4.6.1 Mission Need Statement Content

The Mission Need Statement is a stand-alone document that provides the written rationale for the decision to proceed with the project. It should describe the general parameters of the project, how it fits within the mission of the Program Office, and why it is critical to the overall accomplishment of the Department mission, including the benefits to be realized. Interfaces with other DOE organizations, National Laboratories, or outside stakeholders should also be

described. The Mission Need Statement should include the following elements, but should be tailored to the specific requirements of each situation.

Title Page. Prepare a title page with the following information.

- Mission Need Statement Title
- Identify as a Major or Non-Major System Acquisition Project
- Submission Date
- Originator
- Originator's Phone Number
- Originator's Organization
- Approving Official's Signature Page

Statement of Mission Need. Identify and describe the mission need (capability shortfall or gap) and authority for its accomplishment. If applicable, identify a specific reference in the planning guidance, specific functional strategic plans, or other plans to which the need responds. Describe how the project fits within the mission of the Program Office and why it is critical to the overall accomplishment of the Department mission, including the benefits to be realized. Identify the functional capability needed, technological opportunity, or services to be provided. Describe the functional concept changes that create the mission need, or which are expected to improve mission effectiveness or efficiency. Cite any Congressional or other high-level direction to support the needed capability. Cite any statutory or regulatory authority for the need.

Analysis to Support Mission Need. Present the analysis that resulted in the identification of a capability shortfall and explain the performance analysis to identify and quantify the extent of the shortfall over time. This analysis must include an assessment of existing capability of systems, facilities, equipment, or other assets currently deployed or presently planned independent of this mission need, and the establishment of specific limitations of the existing capability to meet the projected requirements. There should also be a discussion of the range of alternatives being considered to meet the need. Define and explain the criteria used to measure performance. Include appropriate graphs, tables, and formulas to define the extent of the shortfall.

Importance of Mission Need and Impact if Not approved. State the priority of this mission need relative to other agency needs through the description of benefits, achievement of Departmental and program goals and outcomes. Benefits may result from more efficient operations, increased safety, lower operational costs, or other savings. The summary of accrued benefits should describe ground rules and assumptions. First, assess the priority of this need relative to other needs within the program, and then assess the priority relative to needs across all programs. Characterize whether the mission need identifies internal or external capability shortfalls. Describe the impact if this capability shortfall is not resolved relative to DOE's ability to

perform mission responsibilities, on the mission area in particular and on the DOE community in general. Categories of impact include performance in safety, capability, productivity, efficiency, environmental impact, and security. Define the expected change in mission performance. Identify sources used to support the impact analysis. Explain performance analyses used to quantify the impact of not implementing the opportunity, and identify the external factors (such as validated growth projections) used to support the analysis.

Constraints and Assumptions. Identify functional, technical, operational, and financial constraints that could apply to the exploration and acceptance of alternative potential solutions to satisfying the mission need. The impact of the following should be addressed.

- Operational limitations in effectiveness, capacity, technology, organizations or other special considerations
- Limitations associated with the organizational, geographic, or environmental location
- Standardization and standards requirements
- Environmental, safety and health requirements
- Safeguards and security considerations
- Interfaces with existing and planned acquisitions
- Affordability limits on investment that can or will be placed on the possible development and acquisition
- Goals for limitations on recurring or operating costs
- Legal and regulatory constraints and requirements
- Stakeholder considerations
- Limitations associated with the program structure, competition and contracting, streamlining, and the use of development prototypes or demonstrations

Applicable Conditions and Interfaces. State all significant conditions affecting the project, such as requirements for compatibility with existing or future systems and any known cost, schedule, and capability or performance constraints. Include the functional concept and operating methods used to accomplish the mission. Identify any cooperative opportunities, such as a program addressing a similar need at another Department component, Federal agency, university or other entity.

Resource Requirements and Schedule. Provide a timeline for key milestones for this acquisition. Identify the potential total cost range as well as a profile of funding required by fiscal year over the duration of the project based on the upper bound of the cost estimate. The resource requirements will also include costs for exploration of concepts as well as the development

of solutions and alternatives. Resource planning estimates in the mission need statement are NOT engineering-derived life-cycle cost estimates, but should be sufficient to support budget requests for the planning period. Resource planning estimates are translated to engineering estimates after approval of the mission need. Include the measures that will determine whether or not the project was successful from a cost, schedule and scope standpoint and the major deliverables that would signify completion of the project.

Development Plan. Summarize the previous planning activities which have occurred to date. List the activities and schedule for reaching the major milestones and Critical Decision points. Describe the approach to concept development and the expected outcome of the development process. Describe the possible alternatives to be pursued during concept development. The range of alternatives should include, in addition to a new capability, use of existing capability at other locations or modification of existing capability.

4.6.2 Critical Decision 0, Approve Mission Need

All Critical Decision-0 submissions are preferred to be in electronic format (MS-Word) and sent to ESAAB.SECRETARIAT@hq.doe.gov at least 3 weeks prior to any requested or scheduled decisional briefings. A hard copy should be sent to OECM. OECM will coordinate with the Office of Program Analysis & Evaluation for assessment on all Mission Need Statements and associated justification documents, and the Office of Program Analysis & Evaluation will provide a recommendation to the Program Secretarial Officer/Deputy Administrator.

4.7 TAILORING

The analytical rigor and documentation for new starts or new capabilities will likely be greater than for needs that relate to existing missions or assets. For example, a Mission Need Statement in support of routine infrastructure restorations does not require the same effort as a mission need supporting the capability to treat high-level waste. Mission needs related to renovation, repairs, and upgrades of existing capital assets will be typically based on eliminating or preventing degradation of existing missions, or improving efficiency and effectiveness. Mission needs for scientific system upgrades can be stated in terms of increased mission capability based on the results of prior research or technological advances in instrumentation. For instance, when a program envisions repairing and renovating multiple assets at the same location, the mission need may encompass the total program rather than each individual repair or renovation project. Similarly, remediation mission needs should define the total effort and not each individual operable unit. There is no required one-to-one correlation between mission needs and the acquisition process that is used to meet the need. Mission needs may and should, in some cases, result in multiple projects.

CHAPTER 5. DEFINITION PHASE

5.1 INTRODUCTION AND KEY TERMS

The Definition Phase comprises the iterative process that develops and analyzes the concepts and alternatives available for meeting the approved mission need. This process uses a systems methodology that integrates requirements analysis, risks analysis, acquisition strategies, and concept exploration to evolve a cost-effective solution to meet a mission need. Following are the key terms used in this chapter.

- Acquisition Strategy
- Conceptual Design
- Life-Cycle Cost
- Project Execution Plan
- Risk Analysis
- Systems Engineering
- Value Management

5.2 CONCEPTUAL DESIGN

The conceptual design effort is dependent on the nature of the need. While it is normal for solutions to quickly present themselves in response to a need, the conceptual design process must be approached methodically to ensure that the arrived at solution or alternatives are not merely responsive to an approved need, but are within the current technology, are affordable, and provide the best value to the Department. Research, development, testing and other efforts may be required that will contribute to the concept. The conceptual design process may also require negotiation with outside organizations, stakeholders or other legal entities to agree on functional, technical, operational requirements, performance requirements or standards. Value management is a key ingredient in the process that supports reaching the lowest cost alternatives. Value management should be employed as early as possible in the project development and design process so recommendations can be included in the planning and implemented without delaying the progress of the project or causing significant rework of completed designs. Value management conducted during the early phases of capital asset acquisition yields the greatest cost reductions.

5.2.1 Requirements Analysis

The requirements identification process begins in the project Initiation Phase with the development of the mission need. The mission need statement documents the requirement for a specific capability, defined in terms of its required performance. Upon approval, the project team begins concept development, conducting research and development, prototyping, technology demonstrations and other activities necessary to analyze alternatives and select the appropriate alternatives. During these activities, analysis and documentation of the requirements are accomplished.

The requirements analysis process develops the programmatic, system, functional or technical requirements for hardware, software, facilities, personnel, procedures, technical data, personnel training, and initial spares needed to acquire, test, deploy, operate, and maintain a capital asset. Requirements analysis provides underpinning of the conceptual design process and connects the solution to the need.

These requirements further define what an asset must achieve. Functional requirements are developed, describing the functionality of the asset and how the identified functions relate to each other. In many cases, functional requirements may be augmented with specific standards, design requirements, safety, quality, and other parameters that have some legal basis for their inclusion. Requirements define and describe the extent to which a function is to be executed and are generally measured in terms of quantity, quality, coverage, timelines, safety, and products. The requirements documentation provides the traceability throughout the entire acquisition process and connects the performance and operational testing to mission need to provide verification of having met the need. It is the critical element in maintaining the connection between the mission need and the conceptual design and alternatives.

The earlier project requirements can be identified and defined, the more effectively and efficiently a project will progress through the various phases, and meet project baselines, agreements, and commitments. As a project progresses from mission need through concept exploration, development, and design, the process of identifying, analyzing, and refining requirements is continual and is always traceable to specifications and designs. Because the requirements are the foundation for the entire acquisition process, they are part of the baseline and are placed under an established change control system.

Requirements can and do originate from many sources, including—

- mission need;
- strategic plans and objectives;
- legal agreements between the Federal Government and other legal entities and organizaitons;

- national codes and standards;
- Department Orders, Manuals and Standards;
- background and knowledge of project personnel;
- operations concepts;
- lessons learned from other projects;
- research and development activities as well as pilot plant and full-scale testing;
- industrial organizations and industry experts; and
- other organizations such as the Defense Nuclear Facilities Safety Board, citizen's groups, and stakeholders.

As a project progresses through concept exploration and design, the requirements evolve into increasing levels of detail and specificity.

Performance or System Functions. The overall functions and capabilities are specified. At this early stage, the functional statements address the areas of programmatic mission, safety, environment, and other necessary general functions. For large systems, facilities, or remediations, the functions should comprehensively describe how those systems contribute to meeting the need. These are the high-level requirements and form the basis for the performance parameters in the Acquisition Performance Baseline.

System Functional Requirements. These requirements include sufficient detail to establish the criteria or limits against which the actual capability of the as-built or remediated system can be accepted. These requirements are used to evaluate potential alternatives or competing solutions.

Subsystem and Component Requirements. Specific requirements required of component, subsystem, or subelement within an alternative. They provide the individual specification required of the subsystem or component that are necessary for the item to appropriately support the larger system.

Specific Standards. These include the Codes, Standards, Regulations, and needed discipline (electrical, mechanical, nuclear, fire, radiation control, etc.) requirements to procure, fabricate, construct, inspect, and test the components, subsystems, and systems. They are generally detailed in individual specifications or drawings, however, some provide broad coverage, like a piping or building code which may be specified at a high level, but is to be carried through to the lowest level.

5.2.2 Alternatives Analysis

While the requirements define what the asset must achieve and how it must perform, the process of analyzing alternatives leads to identification of the solution that will best meet those requirements. Often, a solution is obvious and other times it may only seem obvious. The analysis is necessary to determine if a potential solution is available, affordable, and where the benefits outweigh the cost. Consideration must be given to whether the technology is readily available to implement the potential solution. If research and development is necessary, has the technology advanced beyond the fundamental research? Are real applications to the necessary technology available? In some cases competing alternative design concepts must be pursued to determine the feasibility of a particular alternative. Consideration of the life-cycle costs, including operations, maintenance, and disposal, are part of the alternative analysis. The life-cycle costs incurred by a chosen alternative may not be affordable to the program and may constrain the ability of the program in meeting its overall strategic objectives. For assets that are intended to provide production capability, analysis must be conducted to ensure that production or manufacturing rates can be achieved with a specific alternative. Demonstrations and prototyping, which provide proof of principle, are sometimes necessary to determine if the technology used by an alternative is realistic and reliable. The selection of a recommended alternative must be based on a systematic analysis of the benefits and costs.

5.2.3 Systems Engineering And Value Management Planning

Systems Engineering

A system is an integrated composite of people, products, and processes that provides a capability to satisfy a need or objective. Systems engineering is an interdisciplinary collaborative approach that is accomplished by integrating three major elements.

- Development phasing that controls the design process and provides baselines that coordinate design efforts
- A process that provides a structure for solving design problems and tracking requirements flow through the design effort
- Life-cycle integration that involves users in the design process and ensures that the developed product is viable throughout its life

Each of these elements is necessary to achieve proper management of a development effort. The primary goal of the systems engineering process is to transform mission operational requirements or remediation into system architecture, performance parameters, and design details. The application of systems approach is tailored to the project's needs. A project need not be a system to use a systems methodology. Systems engineering is a tool that consists of iterative processes, such as requirements analysis, alternative studies, and functional analysis and allocation. Integrated Project Teams perform this planning and analysis to develop the subfunctions and

their relationships that are necessary and sufficient to accomplish the desired top-level functions. These subfunctions form the key input for the project's Work Breakdown Structure.

The Work Breakdown Structure should define the total capability to be developed or produced; display the total capability as a product-oriented family tree composed of hardware, software, services, data, facilities and other components; and relate the elements of work to each other and to the end product. The objective of the Work Breakdown Structure is to provide the means to allocate resources, schedule, and control the project at the product level. Work Breakdown Structures with excessive level of effort or activity-based rather than product-based do not provide the insight to the resource load and critical path analysis necessary to ensure that the project is under control. For these and other reasons, product-oriented Work Breakdown Structures are the only acceptable WBS for the acquisition of capital assets.

At each level (system, subsystem, and component), subfunctions are identified based on the functions, requirements, and resulting design decisions from the previous level. As the level of detail increases, the subfunctions are allocated to systems, subsystems, and/or components.

For complex activities, a functional hierarchy diagram may be used to depict the breakdown of functions into subfunctions. Also, a functional flow block diagram may be generated to show the logical relationship of functions or subfunctions at the system or subsystem level. The functional flow diagram may be used to document which system, subsystem, or component performs the function and subfunctions.

A systems engineering management plan may be necessary when the complex systems, plants, or other efforts are envisioned. For small, noncomplex projects, systems engineering may be used as an approach to ensure solutions meet needs. A systems approach is the preferred methodology for analyzing, defining, and designing solutions to meet mission needs.

Value Management

The value management methodology, (also known as value analysis, value engineering, value planning, etc.) is a consideration in all capital asset acquisition process phases. Value Management is defined as an organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life-cycle cost consistent with required performance, quality, reliability and safety. Value management is a technique directed toward analyzing the functions of an item or process to determine "best value," or the best relationship between worth and cost. The Value Management Program is an integral part of the overall project delivery process and is not a separate entity designed to "second-guess" the Integrated Project Team or design authority.

The Department uses a two-tiered approach, as defined in the Federal Acquisition Regulation to implement a viable cost-effective value management program. The two approaches are the "mandatory program" and the "incentive" (also known as voluntary) program.

Value Management Program. OMB allows Agencies to apply value management to achieve the greatest benefit. The minimum requirements consistent with the two approaches described in the Federal Acquisition Regulation, Part 48, are as follows.

One approach, mandatory value management program, is used for all facility construction activities. For maximum benefit, value management should be useed as early as possible in the project development and design process so valid recommendations can be implemented without delaying the progress of the project or causing significant rework of completed designs. Value management uses a systematic procedure for analyzing requirements and translating these into the most economical means for providing essential functions without impairing essential performance, reliability, quality, maintainability, and safety. This organized effort is commonly referred to as the Value Methodology Standard. The Value Methodology Standard is the systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall life-cycle cost. All mandatory studies conducted before Critical Decision-2 are accomplished using value management methodology.

The second approach, the value management incentive program, should be used in all contracts awarded on facility construction projects after Critical Decision-2, where the following contract conditions exist.

- The Department or its agents have dictated the specifications, design, process, etc., that the contractor is to follow.
- The contractor's cost reduction effort is not covered under award fee (or any other incentive).
- The contracting officer has confidence in the cost estimate for the work at issue(i.e., confidence the cost estimate is close to normal Federal Acquisition Regulation pricing conditions).
- The contracting officer has great confidence in the contractor's accounting system and/or can separately track costs of value management efforts based upon the contractor's assertions and confirmation from the Department cognizant chief financial officer.
- The proposal, if accepted, requires a change to the contract and results in overall savings to the Department after implementation.

Additionally, it is the responsibility of the Department's Under Secretaries and their respective organizations to develop criteria and guidelines that conform to Public Law104-106, *National Defense Authorization Act for Fiscal Year 1996*, and OMB Circular A-131, for both in-house personnel and contractors that identify programs and projects with the most potential to yield savings from the application of value management techniques.

5.2.4 Conceptual Design Report

The Conceptual Design Report is developed during the conceptual exploration and design process when the outcome is envisioned as an asset that performs a specific function. When used in this Manual, the Conceptual Design Report refers to the documentation that identifies the requirements and concept for fulfilling those requirements. The Conceptual Design Report is often the first technical document produced during the acquisition process. It is a necessary element in decision making because it presents the results of analysis of requirements, risks, and alternatives to arrive at a recommended solution. The conceptual design or equivalent should clearly and concisely describe the recommended alternative, the requirements and functions that must be performed and the key performance parameters that form the basis of the Performance Baseline. When the purpose of the project is remediation, restoration, or demolishing, other forms of documenting the requirements and alternative(s) may be used.

Common elements of the report may include the following (and other items not listed) as necessary to support the transition from concept to design.

- A description of the recommended alternative (design or characterization) and a synopsis of the development activities. In remediation projects, the report is a combination of applicable regulations and characterization.
- A schedule and cost range (or rough order of magnitude cost) including resources necessary to complete the design and preparation activity. Including identified resources necessary for a Project Engineering Design budget request, when required.
- An alternatives analysis including life-cycle costs, operational considerations, site development considerations, relationships to other site activities, and the comparison of alternatives, the risks, and the determined preferred alternative. Life-cycle costs are to include decontamination and demolition, transition (personnel and equipment moves), utilities, and maintenance including comparisons that incorporate a review of research and development and/or technology development challenges presented by the selected alternative.
- A preliminary Safeguards and Security Plan
- Performance parameters that are responsive to the mission need
- A preliminary Project Execution Plan
- The summary test and acceptance criteria
- The Work Breakdown Structure, which identifies the elements of the end product and dictionary

- Condition assessments for the facilities, if the project is upgrading existing facilities. These assessments may confirm the suitability of facilities for the proposed action.
- A waste minimization/pollution identification and prevention plan, and a Waste Management Plan including control, storage, treatment, and disposal commensurate with the type of asset and maturity of the planning
- A draft Decontamination and Decommissioning Plan, if required
- Assessments of and strategy for:

  —*The National Environmental Policy Act (NEPA).* The level of NEPA documentation required and the plan for completing these documents in support of the proposed project schedule.

  —*Safety.* The level of safety documentation required for the project, and the plan for completing these documents in support of the proposed project schedule. An initial Hazards Assessment and/or Preliminary Safety Analysis.

  —*Security Considerations.*

  —*Site Selection.* The application of a coherent, defensible methodology to identify and evaluate site options.

  —*Waste Management.* Decontamination and decommissioning plans where appropriate and applicable; waste minimization efforts.
- Public and/or stakeholder input
- Preliminary interface control documents
- System requirements and applicable codes and standards for design, procurement, construction, or characterization
- Site selection criteria and site surveys/ evaluations
- Anticipated/project products/deliverables (project end-state)
- Known and anticipated project constraints
- Conceptual design drawings/renderings/calculations
- Readiness assessment or readiness review concepts
- A vulnerability assessment
- A preliminary plan for demobilization and/or disposal of facilities being replaced

5.3 RISK ANALYSIS

The Integrated Project Team conducts a comprehensive risk analysis for all projects. A full understanding of the risks for each potential alternative is a significant factor in the recommendation of a specific alternative. Risk analysis is accomplished in a formal setting that identifies the possible risks to successfully completing the project. The risks are identified by the likelihood of occurrence and the probable impact if the risk occurs. The complexity of many of the projects reflects the complexity of DOE's missions. Often, a less complex alternative may not be available and the risks associated with some projects must be accepted. The purpose, of risk analysis is not solely to avoid risks, but to understand the risks to an acquisition and devise methodologies and strategies for managing the risks. Risk Management is discussed in detail later in this Manual. For the purposes of selecting an alternative, understanding the risks to successful completion of the project is a significant factor for decision makers. The risk analysis is analytical in nature and, while simulation tools aid the analysts in assessing the impact and consequences, no simulation tool can substitute for a logical deterministic process. Formal risk management plans are developed for projects, which have been designated as Major Systems.

5.4 ACQUISITION STRATEGY

The mission need will have identified the range of acquisition alternatives. As the concept evolves and alternatives are investigated, an acquisition strategy is developed that will provide the conceptual basis of the plan a project follows in execution. A carefully developed and consistently executed strategy is one of the keys to a successful project. It is often a difficult and challenging task to blend the multitude of requirements for an acquisition into an acquisition strategy that also represents a consensus among the organizations that influence or are influenced by the project.

An acquisition strategy is a high-level business and technical management approach designed to achieve project objectives within specified resource constraints. It is the framework for planning, organizing, staffing, controlling, and leading a project. It provides a master schedule for activities essential for project success, and for formulating functional strategies and plans.

The strategy should be structured to achieve project stability by minimizing technical, schedule, and cost risks. Thus, the criteria of realism, stability, balance, flexibility, and managed risk should be used to guide the development and execution of an acquisition strategy and evaluate its effectiveness. The acquisition strategy must reflect the interrelationships and schedule of acquisition phases and events based on a logical sequence of demonstrated accomplishments, not on fiscal or calendar expediency.

The acquisition strategy conveys the Integrated Project Team's approach for the successful acquisition of the project, its intended outcomes, and rationale for that approach. The approach should address the market conditions, effective use of competition, and performance based contracting opportunities. Projects may require multiple contracts. The strategy should also

address the management strategy that the program intends to use in order to integrate multiple contractor efforts. Approvals of mission needs and acquisition strategies do not constitute approvals required by the Office of Procurement and Assistance Management for specific contract clearance purposes, including contract acquisition plans.

Federal officials develop the acquisition strategy. The Integrated Project Team should review previous strategies for similar projects and discuss them with the key personnel involved to take advantage of lessons learned. Industry and laboratories may be consulted during the development of the acquisition strategy. However, care must be taken to avoid release or pre-procurement sensitive information that could be construed as giving existing contractors a competitive advantage.

5.4.1 Acquisition Strategy Content

The strategy should be a logical extension from the approved mission need, narrowing the range of acquisition alternatives to the one or group best suited for the project. The strategy should be tailored based on the size, risk, and complexity of the project. When an element is not applicable, include a brief explanation. The strategy should focus on *quality* rather than *quantity*. For very large or complex projects, the acquisition strategy may include other supporting analysis or materials pertinent to the conclusion. The acquisition strategy should consider the following elements.

- The project title should be the same as was presented in the mission need if the title has changed, reference the prior title.

- Identify the primary office of responsibility for the project

- Describe how the project fits within the mission of the program office and why it is critical to the overall accomplishment of the DOE mission, including the benefits to be realized. List the mission need approval date, the approving official, and summarize any material changes from the approved mission need.

- Describe the key technical and performance parameters for the project, including the proposed location. For each new facility, show the square footage and address the elimination by transfer, sale, or demolition of excess buildings and facilities. Include important laws, agreements, or other factors which significantly influence the project.

- Identify the projected Total Project Cost, expressed as a range, including a funding profile that distributes the cost by fiscal year. The Total Project Cost consists preconstruction construction or implemenation costs, costs, such as conceptual design, preliminary design, research and development, training and startup costs. Discuss lifecycle costs, including costs of dismantling and demolition at project completion. Identify the source of funds, including those from outside sources. Identify key milestones and events in the acquisition, development, and implementation process. Include the discussion of the total life-cycle costs and benefits consistent with the policies

described in OMB A-94,: Guidelines and Discount Rates for Benefit Cost Analysis of Federal Programs.

- Identify applicable conditions and factors that may affect the operational, design, or execution requirements, such as those regulated bythe U.S. Environmental Protection Agency, State and other legal entities; economic factors, technological and political sensitivities and conditions should be discussed. For example, discuss the applicability of and expected milestones for the environmental assessment or environmental impact statement, and the proposed resolution of any environmental related requirements that affect the project.

- Identify the major acquisition, management, technical, cost, and schedule risks and how handling the risks will influence the strategy. While external risks, which originate from factors usually outside the control of the project and often associated with those requirements and constraints that define the project limits, should be discussed, the main emphasis should be on the internal risks over which the project has more direct control. They result from decisions made within the program or project office that affect cost, schedule, performance, and technical approaches to be used when the acquisition strategy is developed or modified.

- Discuss the approach to the acquisition, including managing and executing the project. Identify the acquisition alternatives and site locations. The strategy should evolve from the possible alternatives that focus on the plan best suited for satisfying the mission need in the most effective, economical, and timely manner. The program should consider each alternative course of action across the following key discriminators which may may influence the selected strategy: cost, schedule, risks, technology requirements, interfaces and integration requirements, safeguards and security, location and site conditions, legal and regulatory considerations, significant environmental, safety, and health requirements, stakeholder issues, government furnished property, services, and information. For example, each alterntaive course of action should include the potential use of similar capabilities at other sites, modification or renovation of existing facilities, or doing nothing. Each alternative should also include contract alternatives, including the use of a prime contractor, integrating, or multiple contractors and the rationale for the recommended alternative.

- Discuss the methods of competition that will be sought, promoted, and sustained throughout the course of the project. If full and open competition is not contemplated, summarize the decision why this is appropriate. If an existing prime contract will be used, discuss the rationale for this approach. Describe each major contract contemplated. Discuss the contract type selected (e.g., fixed-price, cost-plus), including incentive and fee arrangements. Identify the use of special acquisition procedures (e.g., design-build or design-negotiate-build) and demonstrations that may be used to reduce risk. Discuss whether sealed bidding or best value processes will be used and why. Describe the planned incentive approach and how performance incentives for each major acquisition (e.g., objective award fee, incentive fee, performance-based contract, cost savings/cost

reduction) will be used to promote performance. The major types of contracts and incentives proposed should be based on consideration of major risks.

- Discuss the approach to managing the project. Identify the Integrated Project Team, organization structure and staffing skills. Describe the approach to performance evaluation, verification, and validation. Describe the relationships and interfaces between organizational elements. Include descriptions of project management and control systems that will be useed to successfully execute the project.

- Interfaces with other DOE organizations, National Laboratories, or outside stakeholders should be discussed. When a site is subject to the requirements of DOE Acquisition Letter 2000-08 of August 18, 2000, requiring a Site Utilization and Management Plan, the project should be consistent with that site plan. Discuss the impact of this project and its associated contracts and how coordination among programs/projects at the site has been considered for the attainment of the site's mission. Discuss what management system will be used by the Government to monitor the contractor's effort (e.g., Earned Value Management System. Discuss Federal staffing, skills, and structure that will be required to manage the project.

5.4.2 Submission of the Acquisition Strategy

All acquisition strategies for Critical Decision-1 are preferred in electronic format (MSWord) and sent to ESAAB.SECRETARIAT@hq.doe.gov at least 3 weeks prior to any scheduled decisional briefings. The acquisition strategy will be staffed through OECM (ME-90) for the OMBE recommendation. OECM will provide a recommendation memo to the appropriate Program Secretarial Officer or Deputy Administrator. Approval of the strategy does not imply approval of Critical Decision-1. Since the strategy is based on facts and circumstances existing at the time of development, it may be changed when additional information becomes available or conditions change. Change must make good business sense and be justified and documented. Material changes to the acquisition strategy, such as changes in contract type, competition or major milestones, must be documented and approved at the same approval level as the original.

5.4.3 Acquisition Strategy Format

Project Title:

Lead Program Office:

Total Project Cost (TPC) Range:

1. <u>Desired Outcome and Requirements Definition</u>

CD – 0 Approval Date, Approving Official and Any Material Changes

Summary Project Description and Scope

Performance Parameters Required to Obtain Desired Outcome

2. Cost and Schedule Range

Total Project Cost Range

Funding Profile

Key Milestones and Events

3. Major Applicable Conditions

Environmental, Regulatory and Political Sensitivities

Others

4. Risk and Alternatives (Technical, Location, & Acquisition Approach)

The major technical, cost, and schedule risks identified and analyzed to-date should be summarized along with what efforts are planned or underway to manage, monitor, reduce or eliminate risks and the consequences of failure to achieve goals.

- Cost and Schedule Range
- Funding Range and Budget Management
- Technology and Engineering
- Interfaces and Integration Requirements
- Safeguards and Security
- Location and Site Conditions
- Legal and Regulatory
- Environmental, Safety and Health
- Stakeholder Issues

5. Business and Acquisition Approach

Acquisition and Contract Types

Incentive Approach/Linkage to Performance Metrics

Competition

6. Management Structure and Approach

Identify IPT, Organization Structure and Staffing Skills

Approach to Performance Evaluation and Validation (i.e., EVMS)

Interdependencies and Interfaces

5.5 ESTIMATING COSTS

All organizations in the Department prepare life-cycle cost estimates in support of their programs and projects. A life-cycle cost estimate attempts to identify all the costs of an acquisition, from its initiation through disposal of the resulting system at the end of its useful life. Life-cycle cost estimates for the acquisition of capital assets serve two primary purposes. First, they are used at critical decision points and reviews to assess whether the system's cost is affordable, or consistent with the Department's/Project's overall strategic plans and investment strategies. Second, life-cycle cost estimates form the basis for budget requests to Congress. As in other aspects of acquisition management, maximum use should be made of the Integrated Project Teams in the development and review of life-cycle cost estimates. Estimating cost is a continuous process that begins during the conceptual phase through execution. Early in the project, the cost estimates support the recommended alternative and acquisition strategy. The estimates during this early phase of a project contain considerable uncertainty. As the project matures, parametric estimates and then engineering estimates are used to refine the estimate for budget preparation

5.5.1 The Life-Cycle Management Model

Based on all known requirements, the project office prepares an initial life-cycle cost estimate for the Acquisition. As the project passes through its various phases and critical decision points, the life-cycle cost estimate is updated by the project office and reviewed by decision makers. In the cases of Major Systems, at least one additional life-cycle cost estimate should be prepared by an organization independent of the project office and the acquisition chain of command.

For acquisition projects, the life-cycle cost estimate helps decision makers assess the affordability of the system and provides input for necessary cost-benefit analysis. The cost-benefit analysis enables decision makers to assess whether the capital asset will produce satisfactory returns for its investment. Life-cycle cost estimates are prepared in terms of base-year dollars (also known as constant dollars) for a selected base year usually the year of project or program initiation or last critical decision review, (i.e., inflation is not considered for the multiple years over which funds will be required for the acquisition). Thereafter, those base-year dollar cost estimates (escalated to then-year dollars for inflation and outlay patterns) are used as the basis for input to the budgeting phase of the Planning, Programming, Budgeting and Execution System. These estimates ultimately form the basis for the acquisition project's funding request contained in the President's Budget submitted to Congress.

5.5.2 Life-Cycle Cost Model

Life-cycle cost can be defined as the total cost to the government of a project or program over its full life, including costs for research and development, testing, production, facilities, operations, maintenance, personnel, environmental compliance, and disposal. Each of the project's major stakeholders (Congress, project office, contractors, and DOE decision makers) prefers to view life-cycle costs grouped in ways that reflect its particular perspective. Following are the three major ways of grouping and viewing project life-cycle costs.

- *Funding Appropriation.* The Department receives appropriations from Congress falling into two major categories: (1) Capital Construction Expense and (2) Operating Expense.

- *Work Breakdown Structure.* A project provides a framework for the project and technical planning, cost estimating, resource allocations, performance measurements, and status reporting. Cost breakouts by Work Breakdown Structure elements are useful to the project office and contractors in managing the project.

- *Life-Cycle Cost Categories. The Budget Formulation Handbook* contains the detail on these cost categories.

5.5.3 Time Phasing of Costs

In addition to looking at project costs aggregated in the various ways discussed above (i.e., appropriations, Work Breakdown Structure and life-cycle cost categories), the IPT must also be able to determine when these costs will be incurred. Obviously, all costs of a project are not incurred during one fiscal year, and because the Department requests and receives funding annually from Congress, the costs need to be allocated to the fiscal years in which the funds will be available. The time phasing of funding requirements is particularly important in the budget formulation process.

5.6 PROJECT EXECUTION PLAN

All project teams prepare plans for managing their projects. The Integrated Project Team, with the leadership of the Federal Project Director, should develop the Project Execution Plan. The Project Execution Plan summarizes critical information necessary to manage a project. The plan uses the outcome from all project-planning processes and integrates them into a formally approved document used to manage and control project execution. Because of the importance of this particular document to the success of a project, considerable effort needs to be made to ensure that the Project Execution Plan is thorough and comprehensive.

The execution plan is developed using an integrated, systematic approach that ensures a project management system based on effective management practices that are sufficiently flexible to accommodate the size and complexity of the project. Organizational policies, constraints, and assumptions are also inputs into the development of the plan. A preliminary plan should be

prepared and submitted in support of Critical Decision-1, Approve Alternative Selection and Cost Range. The final plan should be prepared and submitted in support of Critical Decision-2, Approve Performance Baseline. The Acquisition Executive approves the plan. The plan should—

- accurately reflect the manner in which the project will be managed and performed;
- receive the necessary local reviews and approvals; and
- be submitted to the appropriate Acquisition Executive in a timely manner, prior to the associated Critical Decision.

Specific project activities and actions to be considered in developing and preparing a Project Execution Plan include—

- identifying project participants' responsibilities, authorities, and accountabilities;
- organizing and preparing a project Work Breakdown Structure and dictionary;
- creating responsibility assignment matrix by interfacing the Organizational Breakdown Structure with the Work Breakdown Structure for assignment of responsibility and delegation of authority;
- identifying the time-phased budget or resource loaded schedule;
- performing critical path calculations and establishing project activity durations;
- developing resource loaded project activities;
- conducting risk assessment and mitigation planning;
- developing a preliminary order of range project cost estimate;
- establishing or identifying a progress (performance) measuring and reporting system; and
- developing a method of communicating results, reviews, and revisions of project documentation to project participants and stakeholders.

Once the project planning methodology is established, the combined skills and knowledge of project team members and external stakeholders are used to maximum advantage in developing the Project Execution Plan. The Project Director builds the team as the team builds the Project Execution Plan, developing both mutual consensus and a sense of ownership.

- The minimum elements covered by the plan should include—Mission Need Statement and project objectives;

- Performance Baseline (cost, schedule and key performance parameters);
- project description, including reference to operational, technical, and functional requirements;
- acquisition strategy;
- life-cycle costs;
- Work Breakdown Structure and dictionary;
- Organizational Breakdown Structure, including responsibility assignment matrix, roles, responsibilities, authorities, and accountabilities; change control management, support functions such as safety analysis, health physics, Environment, Safety, Health, and Quality;*National Environmental Policy Act*, etc.;
- cost and schedule, associated with the Work Breakdown Structure, including identified contingency and management reserves;
- risk analysis and risk management;
- systems engineering and value management planning;
- resource requirements (including budget, staffing, support contracts);
- planned major procurements including long-lead procurement;
- project control and reporting systems;
- site development, permits, and licensing;
- integrated Safety Management;
- Quality Assurance Plan (generally separate, but updated);
- research and development, test and evaluation, alternative studies, trade studies;
- planned design reviews, including critical design reviews and other reviews;
- change control and management;
- inspection, testing, test evaluation, turnover, and startup; and
- training and operational readiness plans.

The plan may be tailored to meet the needs of a project, based on size, scope, complexity, cost, and schedule. As appropriate, topics may be included in the plan by reference. Following approval, the change control process should control changes to the plan. As a project progresses, changes may occur, which could require the plan to be modified or updated. Extensive revisions should be reviewed by and approved by the same organizations that reviewed and approved the original document.

CHAPTER 6. EXECUTION PHASE

6.1 INTRODUCTION AND KEY TERMS

In the Execution Phase, the initial design concepts and preliminary design are further developed into detailed and final designs and plans. These plans will be used to procure or manufacture components, fabricate subsystems, perform remediation, or construct facilities. At this point, performance measurement baselines and change control are established and functioning, environmental and safety requirements are satisfied, and the final design configuration is approved and issued for procurement and implementation.

Execution comprises the longest and most costly phase of a project. It is the phase when controlling, directing, and reporting are most important. The Execution Phase encompasses the activities from preliminary design through turnover for operation and includes design, procurement, construction, testing and turnover, and acceptance.

Following are the key terms used in this chapter.

- Configuration Control Board
- Configuration Management
- Earned Value Management
- Work Breakdown Structure

6.2 PRELIMINARY DESIGN

Evolving the conceptual design into the preliminary design provides the depth and detail to allow the asset to take shape and form. Preliminary design initiates the process of converting concepts to a design appropriate for procurement or construction. This stage of the design is complete when it provides sufficient information to support development of the Performance Baseline. The appropriate completion percentage is dependent upon the project. When the project is less complex, such as a facility repair with single design, the percent complete is generally equivalent to 20 to 35 percent of the total design effort. For complex projects, the percentage of design may not be definitive because these projects may have many subsystems undergoing concurrent designs that may be at various stages of completion. Scientific systems, such as accelerators and detectors, production and manufacturing facilities, spacecraft and other systems, do not follow a linear process in which all subsystems reach the same maturity at the same time. Concurrency in these types of projects increases the risk because each subsystem design is dependent upon the design maturity of other subsystems.

6.3 CRITICAL DECISION 2, APPROVE PERFORMANCE BASELINE

When the design is at a level of maturity and the project is able to define the Performance Baseline with some certainty, the project is submitted to the Acquisition Executive for approval to formally establish the Performance Baseline. The Performance Baseline is the original baseline for the project and is used to prepare and submit project budget requests and capital asset plans to Congress and Office of Management and Budget. The Performance Baseline defines the key parameters for the project, including the performance parameters, technical scope, schedule, and cost to clearly establish the capabilities being acquired along with the total cost and schedule. Performance Baselines are discussed in detail later in this Manual.

6.4 FINAL DESIGN

Final design is the last phase of development prior to implementation. The purpose of the Final Design Phase is to prepare final drawings, technical specifications, and contract documents required to obtain bids and quotes for procurement and construction. The final design should also include clear statements of testing requirements and acceptance criteria for the safety and functionality of all subsystems. The project scope should be frozen and changes should be permitted only for compelling reasons, (i.e., substantial economies achieved through value engineering, accommodation of changed conditions in construction, reduction in funds or changes in requirements).

Design reviews are a vital component of the entire process and should be explicitly included in the schedule for the design effort. The fundamental purpose of the design review and design review checklists is to ensure the following.

- Quality of the design
- Operational and functional objectives are met
- Maintenance of costs within the budget
- Design is biddable, constructible, and cost-effective
- Interface compatibility
- Final contract documents comply with the design criteria
- A detailed, unbiased, analytical approach is given to all of the above items

Many projects may not follow a linear final design process that follows preliminary design. For example, systems such as scientific instrumentation, industrial plants and other similar projects have several subsystems, each having a preliminary and final design stage. Consequently, final designs may be completed at various points in time in the system development process. Other projects may not require a formal engineering final design such as routine demolition of facilities. Regardless, design reviews should be conducted for all projects and should involve a

formalized, structured approach to ensure the reviews are comprehensive, objective, professional, and documented.

6.5 SCHEDULING AND CONTROLLING

In its simplest form, a schedule is a list of activities and events organized by time. In its more complex form, a schedule encompasses all project activities and their relationships to each other in terms of realistic constraints of time, funds, and people (i.e., resources). The schedule is a powerful planning, control, and communications tool that when properly executed supports time and cost estimates, opens communications among personnel involved in project activities, and establishes a commitment to project activities.

Scheduling is a key aspect of project management planning and is integral to a project's acquisition strategy, risk management, and financial and technical management plans. In addition, scheduling is an important element of the other management functions including organizing, staffing, controlling, and leading. Effective scheduling provides the basis for effective communications within the government team and with contractors; identifies a baseline for project status monitoring, reporting, and project control; facilitates effective management; and provides the basis for resource analysis and leveling, exploration of alternatives, and cost/time tradeoff studies.

On the other hand, poor scheduling can adversely impact a project in a number of areas. Haphazard schedules can make it difficult to determine a realistic completion date and to efficiently allocate resources to the entire project. This creates financial problems including escalation of project costs, increased support costs, delayed return on investment, funding cuts, or project termination. Project Directors must have a good working knowledge of scheduling practices and applications (such as Gantt, milestone, and network schedules) achieve project goals. Projects Directors may not always have to construct detailed schedules, but they must be able to understand and analyze schedules created by contractors.

6.5.1 Integrated Master Plans and Schedules

An integrated master plan is a very effective tool for project management. It is the contractor's event-based plan for accomplishing the requirements contained in Statements of Work, Performance Work Statements, Work Authorizations, and other documents which communicate requirements to the contractors. The plan identifies the key activities, events, milestones, and reviews that make up the program or project. The program or project office, support contractors or the prime contractor may prepare the plan. The plan also identifies those events and activities that will be included in the integrated master schedule. The integrated master schedule is a networked multilayered schedule generated by the contractor that begins with all identified integrated master plan events, accomplishments, and criteria. It also shows the expected start and finish dates of these events and contains all contractually required events and milestones such as reviews, tests, completion dates, and deliveries specified in the Work Breakdown Structure. The integrated master plan is prepared prior to completion of the Conceptual Design process and is

subsequently maintained by the government and the contractor through a collaborative effort involving all the stakeholders. The integrated master plan and schedule tie together all project tasks by showing their logical relationships and any constraints controlling the start or finish of each task. This process results in a hierarchy of related functional and layered schedules derived from the Work Breakdown Structure that can be used for monitoring and controlling project progress.

6.5.2 Controlling

The controlling function involves all the activities which ensure that the actual project conforms to the developed plan and the necessary actions to maintain the schedule if possible. The project schedule can serve as a baseline against which to measure progress. If there are indications that an activity is falling behind schedule, this information is used by the manager as a basis for corrective action. However, considering schedule information alone can be misleading. Successful management requires the integration of the technical, schedule, and cost aspects of a project. Thus, some form of integrated performance measurement is needed for monitoring and controlling a project. The concept of earned value management provides such a capability.

6.5.3 Earned Value Management

Earned Value Management is the use of an integrated management system that coordinates work scope, schedule, and cost goals and objectively measures progress towards these goals. The purpose of Earned Value Management is to provide contractor and government managers with accurate data to monitor project execution. It is also intended to provide an adequate basis for sound contractor and government decision making by requiring that the contractor's internal management control systems produce data that indicate work progress; properly relate cost, schedule, and technical accomplishments; are valid, timely, and able to be audited; and provide managers with information at a practical level of summarization.

The Earned Value Management System is the responsibility of the contractor to implement. One element of this system is the contractor's scheduling system which includes the following attributes:

- A summary or master schedule and related subordinate schedules showing vertical traceability from the master to the detailed schedules
- Horizontal traceability showing the interrelationships among various activities
- Identification of key milestones and activities, and significant constraints and relationships
- Identification of current status and forecasted completion dates of scheduled work to enable comparison of planned and actual status of project accomplishments
- A clearly established schedule baseline

The schedule baseline usually consists of a hierarchy of vertically integrated schedules, with each lower-level schedule more fully identifying and expanding the tasks necessary to meet the project's objectives. Generally, three sets of schedules are prepared:

- *Master Schedule.* The top-level schedule that summarizes key project activities and milestones and depicts the logical progression of events throughout a contract.

- *Intermediate Schedules.* The schedule that ties the Major System to the detailed schedules. It allows for rollup of detailed schedules to summary levels that are useful for management.

- *Detailed Schedules.* The schedules at the control account or work package level. Work packages must be distinguishable from each other and must include definite start and completion dates. They are prepared by the contractor with government concurrence.

6.6 CONFIGURATION MANAGEMENT

Configuration management is the process of identifying and defining items in a project or system, controlling changes of these items throughout their life cycles, recording and reporting the status of items and change requests, and verifying the completeness and correctness of items. Configuration management consists of a multilayered structure including policy, process, and procedures, with each layer providing an increasing level of detail. This structure provides high-level configuration management requirements and details for how these requirements are to be met. Configuration management applies to all systems, subsystems, and components of the project, including key documents such as the Project Execution Plan. Configuration management control begins with baselining of requirements documentation and ends with decommissioning of equipment.

The configuration management discipline may be applied to hardware, including power systems, software, firmware, documentation, test and support equipment, facility space, spares, training and courseware, and Manuals. A Configuration Control Board ensures that documentation associated with an approved change to a project is updated to reflect the appropriate baseline. Affected documentation may include training material, courseware, and other documentation.

The activities that constitute the configuration management discipline are planning and management, configuration identification, change management, status accounting, and configuration verification and audit. Integrated Project Teams evaluate, select, and tailor specific configuration management activities and develop the processes necessary to perform configuration management in their specific product environment. All Integrated Project Teams, perform the planning, identification, change control, status accounting and audit activities.

6.6.1 Configuration Management: Planning, Coordination and Management

Configuration Management includes planning, coordinating, and managing all tasks necessary to implement configuration management principles and to conduct configuration management activities. Configuration management planning and management occurs throughout all life-cycle phases. Documentation of the planning process and development of the configuration management plan ensures continuity of configuration management practices at all levels of management.

Integrated Project Teams identify configuration items and develop appropriate configuration documentation to define each configuration item. This includes the development of a product top-down structure that summarizes the total units and configuration documentation for the system or configuration item, and the assignment of specific identifiers.

Integrated Project Teams implement and document a systematic and measurable change process that is consistent with national configuration management policy. The implemented change process ensures proposed changes are properly identified, prioritized, documented, coordinated, evaluated, and adjudicated. Approved changes need to be properly documented, implemented, verified, and tracked to ensure incorporation in all systems and spares.

The Integrated Project Team verifies that the project's requirements have been met and the design meeting those requirements has been accurately documented before a configuration is baselined. Verification often takes the form of a functional configuration audit and a physical configuration audit. The functional configuration audit provides a systematic comparison of requirements with the results of tests, analyses, or inspections. The physical configuration audit determines whether the product is consistent with its design documentation. In addition, operational systems must be periodically validated to ensure consistency between a product and its current baseline documentation.

6.6.2 Configuration Control Boards

A Configuration Control Board with a charter and operating procedures is the official forum used to establish configuration management baselines and to approve or disapprove subsequent changes to configuration management baselines. Proposed changes to configuration management baselines should be submitted to the appropriate Configuration Control Board.

6.7 CRITICAL DECISION-3, APPROVE START OF CONSTRUCTION

With design and engineering essentially complete and a critical or final design review and all environmental and safety criteria met, the project is ready to begin construction, implementation, procurement, or fabrication activities. It is submitted to the Acquisition Executive for Critical Decision-3, Approve Start of Construction.

6.8 EXECUTION OR IMPLEMENTATION

Executing or implementing the project requires close coordination and integration of the various physical, contractual, technical, financial, and organizational interfaces. This stage of the project entails significant expenditure of resources and the cost and schedule impact of errors is significant. The importance and both configuration control and performance management cannot be over-emphasized. The continued use of systems engineering techniques, including value management, ensures the project will provide the essential functions at the lowest life-cycle cost consistent with performance, reliability, quality, and safety requirements. Execution of safety, environmental, and quality plans and requirements are also continued throughout this phase.

During this stage of the project, the critical success factors include:

- Clearly identified contract, procurement, and construction contractor requirements
- Effective management and control of technical, scope, schedule, cost baselines, and risk allocations
- Efficient and effective change control
- Oversight and management of subcontractors and vendors
- Well-planned commissioning and acceptance activities

CHAPTER 7. TRANSITION/CLOSEOUT PHASE

7.1 INTRODUCTION

A planned, structured, and organized project transition and closeout is essential to the success of any project. Transition and closeout is the progression of a project from implementation to turnover for operations.

7.2 TRANSITION AND TURNOVER

The project may begin transition and turnover at the point when it is substantially complete. This point may be defined in terms of beneficial occupancy, initial operating capability, or full operating capability. For facility construction projects, beneficial occupancy is the point at which the facility is turned over to the user or occupants. For environmental restoration projects, initial operating capability may be defined as the point when packaging and disposal of all waste is completed or at the transition to long-term maintenance and surveillance. A project may also define the turnover point at full operational capability. The point at which a project is considered substantially complete, whether classified as initial operational capability, full operational capability, beneficial occupancy or other milestone, is to be defined as part of the Performance Baseline.

Planning for transitioning to the operator, end user, or other organization is an integral part of project planning and performance, and includes the identification of the budget necessary to perform the required activities. Proper planning, preparation, adequate funding, and staffing are essential to transitioning, turnover, and closeout activities. Without proper planning, these activities become time consuming, costly, and may ultimately prove unsatisfactory.

Although a completed facility is the expected end result in buildings, the phased nature of the more complex projects where delivered end items are staggered, due to the concurrent nature of the development, may require partial turnovers. This is particularly the case when there is a mission need or other considerations which warrant incremental operations and completion. Partial turnovers can include equipment items, operating systems, or facility areas. In all cases, a properly planned and implemented project transition and turnover develops ownership within the user organization and serves to transfer ownership from the project to the user. The following activities, some of which precede Critical Decision-4 and some of which follow, are the responsibility of the Project Directors as a project progresses from execution to closeout. These activities can be tailored based on the needs of the project.

The Project Director, with the support of the Integrated Project Team, should establish a turnover, occupancy, and acceptance process that includes punch list item resolution, user walk-downs, verification of compliance with contract requirements, system startup for proper

operation, operations and maintenance workforce training, and documented transition from the project and acceptance by the user. They may also include functional and physical configuration audits. An early turnover activity may be to prepare a memorandum of understanding with the user to document the extent of the turnover package, such as, spare parts, Manuals, procedures, vendor data, etc., that typically are deliverables to the operating organization from the developing organization.

7.3 CHECKOUT, TESTING, AND COMMISSIONING

Early turnover and transition activities include facility walk-downs for identification and correction of physical, process, safety, quality, or environmental deficiencies; and planning, preparation, performance, and documentation of equipment and systems testing and operation. Checkout and test planning and preparation typically begin at the equipment (item) level, progress to the system level, and culminate at the facility level. Test planning begins during design to ensure that physical features necessary to support testing are provided.

7.3.1 Checkout

Equipment, systems, facility checkout and walk-down efforts are performed by the contractor in cooperation with the project organization to identify problems and deficiencies. The team maintains lists of findings punch lists and initiates documentation to implement corrective actions. Identified corrective actions are tracked through closeout.

Walk-downs are performed by organizing combined project and operator teams that review and inspect equipment, systems, or facilities as they are declared complete by the construction contractor, and comparing the “completed product” against approved requirements. The team documents discrepancies and deficiencies using a punch list, identifies corrective actions, assigns a responsible individual for each deficiency, and identifies a corrective action completion date. Deficient items are tracked to completion and then re-inspected and retested for acceptability if necessary. The walk-down activity should serve as a one of the elements for user acceptance of a completed project. Generally, the contractor is responsible for correcting deficiencies and problems.

For facilities, a safety walk-down is especially important. The safety walk-down should be performed by qualified project and user safety personnel immediately prior to facility transition. A safety walk-down identifies any facility, system, or equipment safety deficiencies that might still exist. A safety walk-down team is instructed concerning the purpose of the walk-down and is to be totally focused on safety.

7.3.2 Testing, Evaluation, and Commissioning

The purpose of testing is to ensure that the delivery product meets not only the technical specifications, but also the function requirements established during the conceptual design. The development of system and component test procedures is prepared prior to the completion of the

implementation effort. Test and commissioning teams can be structured to possess the capabilities necessary to prepare test plans, perform all test activities, evaluate test results, and identify and initiate corrective actions. The test teams may include project and operator staff. Testing serves to verify that the components, systems, and facilities meet or exceed design requirements and performance parameters, and to helps to train operator personnel in the operation of the equipment, systems and other components of the completed project. Key activities include the preparation and approval of test procedures, and the organization of test teams. Procedures are prepared by personnel who are or will be part of the test teams. Staff from the operator organization is also part of the test teams.

7.4 KNOWLEDGE TRANSFER

The project organization works closely with the user in developing and presenting specific process and facility related training, and continues to provide support to the operations and maintenance staff throughout transition and turnover. Initial training is one of the primary mechanisms for transferring knowledge regarding the asset. This training may take of the form of "on the job training," formal classes or combinations of the two. A key benefit of training is the transfer of knowledge and experience gained by development and engineering staff to the operating organization prior to the loss of the project team once the project is completed.

7.5 DOCUMENTATION

Turnover of a completed project to the user should include the turnover of appropriate project documentation/records. Records should be complete, properly identified, approved, and orderly. Records not provided to the customer are prepared for storage or disposal. Records include design, procurement, construction, pre-operational testing, startup, safety, quality, operations and maintenance Manuals, manufacturer's warranties, and as-builts. In certain cases, electronic and hard copies of project records may be provided. As appropriate, project documentation that supports transition, turnover, operational readiness review, and operation are to be made available to the user organization. All records that are turned over to the user or sent to storage should be accompanied by a complete inventory list. A duplicate of these lists should be maintained by the project organization.

7.6 LESSONS LEARNED

At completion, the project should prepare, distribute, and place into the permanent project records, a lessons learned document. This includes any lessons learned from value management. If properly planned, a project lessons-learned program is in place when the project is organized, with frequent distribution of interim lessons learned reports. The final lessons learned report then becomes merely the assembling and issuing interim reports as a single document.

7.7 LOGISTICS

The Integrated Project Team should ensure the following items are available as part of the turnover process:

Operating and maintenance Manuals and procedures

Vendor data files including drawings, Manuals, and specifications

Manufacturer's warranties

Preventive maintenance procedures and preventive maintenance records for those items of equipment purchased by the project that have required or will require preventive maintenance prior to turnover

Special tools, lubricants, and spare parts as recommended by vendors, with sufficient inventory provided for one year of operation

Initial spares that would ensure continued operation without extended downtime to meet reliability, availability, and maintainability requirements

The Integrated Project Team should also ensure that operations and maintenance staff are properly trained and qualified to operate and maintain the equipment, systems, and facilities being turned over.

7.8 READINESS REVIEWS

The Integrated Project Team remains engaged during the readiness assessment and operational readiness review to provide support, advice, and expertise to the operational organization.

Depending upon the type, size, and complexity of the asset, the operational readiness review and acceptance process can be lengthy and costly. Consequently, the review planning and preparation begins during conceptual design and continues throughout the project life cycle. Planning may involve the Integrated Project Team as well as the operating organization. Typically, the Project Director is responsible for ensuring the facilities, equipment, systems, and documentation are ready for an operational readiness review. The operating organization is responsible for staff selection, training, qualification, and certification as well as operating, maintenance, and safety procedures. The operating organization is also responsible for interfacing with and supporting the operational readiness review team.

7.9 CRITICAL DECISION-4, APPROVE START OF OPERATIONS OR PROJECT CLOSEOUT

When construction, testing, and turnover are complete and the operational capability has been attained, the project is ready for Critical Decision-4, Approve Start of Operations or Project Closeout. A key part of obtaining Critical Decision-4 is the delivery of appropriate project-

related documentation to support the initiation of operations. The key discriminator in the turnover is the operational organization's readiness for assuming operational responsibility and the government acceptance of the asset.

7.9.1 Prerequisites for Critical Decision-4

Verify performance criteria have been met.

Issue a Final Safety Analysis Report or appropriate safety documentation.

Prepare operating and maintenance procedures.

Complete acceptance testing and correct deficiencies.

Complete a readiness assessment or operational readiness review.

Provide a trained and qualified operations and maintenance staff.

Complete and issue a project transition-to-operations report.

If necessary, prepare and issue a project closeout plan that includes management agreement for final fiscal cost and administration closure.

7.9.2 Post-Activities for Critical Decision-4

Demobilize the project.

Approve and complete a migration to production for software.

Complete operational documentation.

Complete as-builts.

Prepare and issue a lessons learned report.

Prepared and issue a project completion report.

7.10 PROJECT CLOSEOUT

Termination of a project involves bringing the project to a planned and orderly conclusion, with as much care and attention as other project phases. Termination and closeout phases need to be controlled to avoid an occurrence where project personnel either leave or are reassigned prior to final project closeout, leaving others to "clean up."

The primary issues that arise during completion are procedural and emotional. The Integrated Project Team should strive to effectively resolve both as part of the closeout effort.

7.10.1 Demobilization

Demobilization is a significant event for the project staff. Emotional issues involve project team breakup and loss of identity, a need for fewer personnel during project completion, pressure from functional organizations to return personnel, and project personnel concerns about their next assignment. To smooth out the demobilization process, the Project Director should consider the following:

A closeout plan including an evaluation of existing resource requirements

Meeting with the project team to provide information, finalize remaining tasks and provide support to remaining team members

Determine assignments to complete final project documentation such as a summary status report, budget report, final costs report, and executive summary

Provide information presentations for the Department staff, the operational organization, stakeholders, and media

Work with functional peers and team members to establish clear phase-out procedures in terms of each individual's responsibilities, availability, and future assignments

Meet with human resources, functional managers, and line managers to identify personnel needs; assist team members in scheduling interviews; and participate in matching needs, capabilities, and availability

Acknowledge and recognize the contributions of all project participants.

7.10.2 Administrative and Financial Closeout

After either achieving the objectives or being terminated for other reasons, a project requires closeout. Administrative and financial closeout verifies and documents project results to formalize acceptance of a project by the user. It includes project records, analysis of project success and effectiveness, and archived information for future use.

Administrative and financial closeout activities are not deferred until project completion. Each phase of the project should be properly closed to ensure that important and useful information is not destroyed or lost. Contracts are closed in a timely fashion and plans are laid for final closeout prior to the loss of key project institutional knowledge.

All documents that record and analyze project performance, including planning documents that establish the framework for performance measurement, are to be available for review during administrative closeout. This includes appropriate project records that aid understanding project initiation, performance, technical, schedule, and cost scopes. Documents that describe the project deliverables (plans, specifications, technical reports/studies, drawings, electronic files, etc.) may also be available for review.

A set of indexed project records is prepared by the project for archiving. Any project-specific or program-wide historical databases pertinent to the project are updated. When projects are performed under contract, or when they involve significant procurement activity, particular attention may be given to archiving financial records.

Documentation stating that a client/sponsor/user accepts the product of a project is to be prepared, signed, distributed, and filed.

7.10.3 Final Closeout

Final Closeout involves procedural issues and phase-out administrative procedures, transfer of responsibilities, financial closeout activities, and preparation of appropriate documentation. The purpose of a project closeout effort is to ensure a timely, orderly, and cost-effective project termination. If the closeout is complex and may take substantial time, a closeout plan should be issued prior to full project demobilization. To ensure orderly closeout of a project, the Project Director should, at the direction of DOE—once all costs are incurred against the project with invoices and contracts are closed—prepare a project closeout report following the approval of Critical Decision-4. The following items should be addressed in the closeout report:

Technical, scope, cost, and schedule baseline accomplishments

Financial closeout, including a final cost report with details as required (including claims and claims settlement strategy where appropriate)

Deactivation, decontamination and decommissioning planning (if required)

Closeout approvals

Permits, licenses, and/or environmental documentation

Contract closeout status

Adjustments to obligations and costs

Photographic documentation

Baseline change control log

CHAPTER 8. PROJECT BUDGET DEVELOPMENT

8.1 INTRODUCTION AND KEY TERMS

This chapter provides an overview of project budget development and the relationship to DOE's Planning, Programming, Budgeting and Evaluation Process. Specific requirements for preparing and submitting a budget can be found in the *Budget Formulation Handbook*.

Key terms used in this chapter include the following.

- Budget Authority
- Capital Asset Plans
- Constant-Year Dollars
- Contingency
- Management Reserve
- Project Data Sheets
- Then-Year Dollars

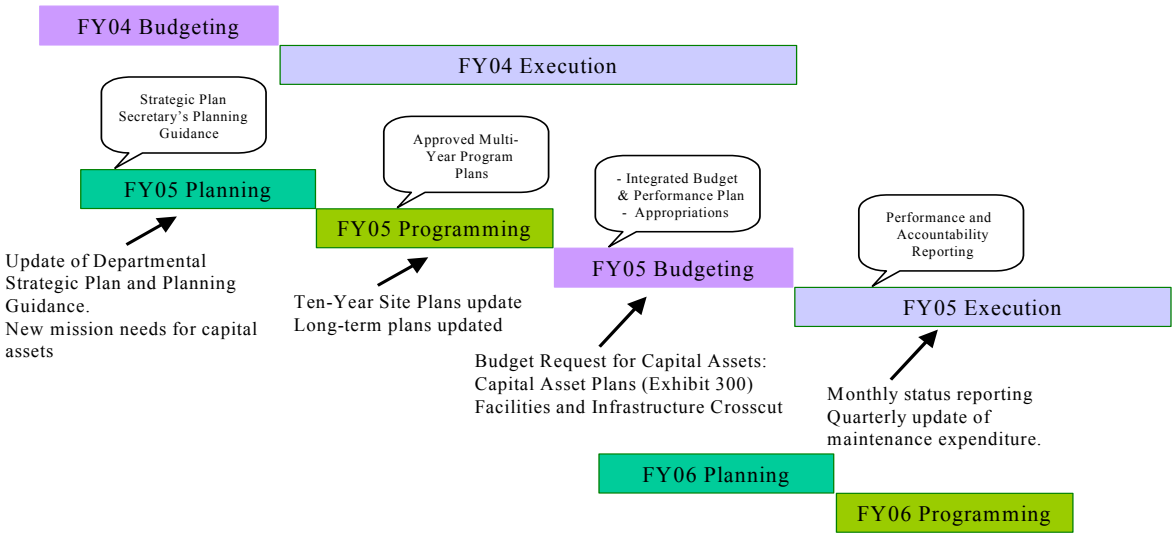
8.2 PLANNING, PROGRAMMING, BUDGETING, AND EVALUATION

Budgeting for the acquisition of capital assets is an integral part of DOE's Planning, Programming, Budgeting, and Evaluation (PPBE) Process. The PPBE Process provides a systematic framework for prioritizing program needs, allocating resources, measuring performance and delivering results. The PPBE Process is cyclical and its products are updated each fiscal year. Building a project budget evolves from the total estimate for the project. Project cost estimates are normally done in *constant-year dollars* ignoring the effects of inflation and the budgeting implications of using various appropriations, or "colors of money." However, both of these factors must be taken into consideration in constructing the project budget in *then-year dollars.* A summary level integration of the project process and the budget process is illustrated in Figure 8-1.

8.3 CONSTRUCTING A DEFENSIBLE BUDGET REQUEST

Constructing a defensible budget request follows a logical sequence.

- Determine what the project is expected to accomplish.
- Break the work into quantifiable elements.



- Allocate resources (labor, materials, equipment) to the work elements.
- Schedule the work.
- Optimize the use of resources across the schedule.
- Assess risk and determine contingency.
- Determine the annual funding requirement.

Concept and Direction

Clear direction minimizes miscommunication in execution. The Performance Baseline sets forth key cost, schedule, technical scope, and performance objectives for the project. The Performance Baseline should clearly identify the key parameters for the end capability being developed.

Work Breakdown Structure

A key step in defining an acquisition project is establishing the Work Breakdown Structure, which breaks down the entire project into its component elements. The Work Breakdown Structure provides a comprehensive basis for projecting financial requirements. Whether the government or a contractor performs the elements, the structure must be compatible with cost estimating and scheduling requirements.

Resource Allocation

The next step is to define the resources necessary to execute each Work Breakdown Structure element. Resources include labor, materials, and equipment. These resources are a part of work packages which define the work for each Work Breakdown Structure element. The labor and materials are assigned unit costs that are summed to determine the total cost for each work package. Planning packages are used when the work has not been completely defined. Budget is assigned to planning packages based on a mature estimate, until such time as a work package can be developed. Note, that when the number of planning packages far exceeds the number of work packages, there is increased risk. It does not necessarily mean that the project is not ready to proceed. However, the number of planning packages should be kept to a minimum.

Project Master Schedule

With a sound Work Breakdown Structure and well-developed work packages you can create a master schedule. You need a reliable estimate of the total time required to accomplish each task and the sequence in which the tasks must be executed. The schedule should reveal if there are tasks which must be completed or partially completed before other tasks begin. These interrelationships are provided by a critical path-type schedule. Task schedules evolve by balancing the work to be done against the time when the work must be completed in order to achieve project milestones.

Resource Leveling

Because resources are finite and all works cannot be accomplished simultaneously, work must be re-organized to ensure existing resources are not overtaxed or underutilized. This effort is called resource leveling. A resource, such as engineering or craft labor, cannot be scheduled to accomplish more than one work package simultaneously. Just as you cannot be in more than one place at a time, neither can the staff assigned to a project execute more than a single work package at the same moment. The resource leveling does not only involve staff. The same piece of equipment cannot be operated in more than one location at a time. There may be other limitations as well, such as capacity of specific work areas, which prohibit multiple activities. The sequencing of the tasks, therefore, is not just an exercise in determining the order of things to be accomplished. It requires planning and analysis to determine what can be done when and in what order.

Contingency

Prudent managers will include “risk dollars” as part of the cost estimate for each Work Breakdown Structure element as appropriate. These risk dollars are the project funds reserved to deal with contingencies when things do not go as planned. The method used should be adapted to the specific needs of each project. *Contingency* is the portion of the project budget that the government holds in reserve to accommodate unknowns regarding requirements and uncertainty that is outside the scope of the contract, but is within the scope of the project. Contingency may be used for additional scope and work that is necessary to meet current requirements. Contingency is not used for new requirements. The contractor uses *management reserve*.

Management reserve is not allocated to work packages or planning packages, but is held in reserve by management to provide flexibility to manage within the contractor Performance Measurement Baseline. Management reserve is used to control the workflow and adjust work packages for rate changes and other unknowns, but is never used for additional scope outside of the authorized work scope.

The method used by the programs to develop their contingency budget may vary depending on the type of project being executed. For some projects where complexity is low and the construction is straightforward, the contingency requirements may be fairly low and may be developed by using an added factor to the budget. In other cases where the uncertainty is greater because of technological, environmental, or other issues, the contingency requirements may be much higher. Contingency is developed through the risk analysis process that weighs the risk likelihood and impact and results in a plan to mitigate the risk. Projects may use probabilistic simulation and analysis to assist in deciding how much contingency would be appropriate for a project. However, DOE does not advocate, nor has it established a standard for probability simulation-based confidence levels. In general, projects should not be undertaken unless the program has high confidence that it can be completed within the established Performance Baseline. Projects where the confidence is low must only be undertaken when the need is great, no other alternatives are feasible and the senior leadership of the Department fully understands the risk.

Developing the Annual Budget

The next step is to total the resources requirements for each fiscal year that will require funding. The annual funding requirements must be evaluated to determine whether there are any spikes to be leveled or if other external budgetary constraints exist that must be taken into account. If adjustments are required, another pass through the scheduling and resource leveling process will be needed to adjust the plan to accommodate the external constraints. In some cases this results in an increase in cost when it becomes necessary to delay some activities due to these constraints. It must also determine what appropriation will be used to fund each task to comply with applicable funding policies.

8.4 APPROPRIATIONS

To execute the project, *budget authority* is provided by Congress to incur obligations and make payments. Budget authority is most commonly provided by an appropriations act, in which Congress specifies the purpose(s) for which each particular appropriation may be used, as well as the amount of budget authority provided under each appropriation. The Department receives two appropriations which may be used for the acquisition of capital assets: Operating Expense and Capital Construction. Because of the cost and size, many Department projects cannot be executed within a single fiscal year and consequently financing of the total requirement in one fiscal year is not feasible. However, when the project will take longer than 12 months but less than 18 months, financing the total requirement should be sought in a single fiscal year.

Depending on the project and its stage, the budget requests, along with the Capital Asset Plans and Project Data Sheets, will contain a request for one or both types of funds.

Long lead procurement and construction funds comprise the Total Estimated Cost of a construction project. The Total Estimated Cost should not be construed to be the total cost for the project. Additional operating expense funds are required and need to be included in the overall project cost. The total cost for a capital asset acquisition is the sum of the Total Estimated Cost and all Other Project Costs necessary to complete the project. The sum of these two cost elements is the Total Project Cost. The Total Project Cost is used in the Performance Baseline and is the cost against which the project measures performance. Costs for the acquisition of capital assets begin to accrue at the point that the Department has approved the mission need. Costs that accrue during the planning process prior to mission need, when performance gaps are being identified, are not normally project costs. Detailed explanations and formats for preparation of budgets and the direction regarding what funds are to be identified for specific types of efforts are found in the *Budget Formulation Handbook*.

8.5 APPLICATION OF INFLATION TO THE FINANCIAL FORECAST

Inflation, defined as an increase over time in the general price level, is a pervasive phenomenon affecting all aspects of financial planning and therefore directly impacts the development of cost/funding forecasts for projects. When a program puts together a cost estimate, it is usually done in constant dollars. Constant dollars are tied to a specific year, with no inflation across the life of a project. This is very useful for cost estimating, since it is easy to make changes across the years without having to consider the impact on the cost of money over time. It is also beneficial if you want to analyze a program to see things like cost growth and the impact of learning curves. However, budget requests are projections into the future, so what is budgeted for today must be what is expected to be paid in the future; i.e., our budget estimate must account for inflation. To properly factor in inflation, it is necessary to account for the effects of rising prices and the timing of when those bills will actually be paid. Since program budget requests must be made prior to receiving and negotiating contract cost proposals, estimates of the anticipated costs and the time-phased profile of their incurrence must be developed. OMB provides the estimated inflation rates or escalation rates that are used to convert constant dollars to then-year dollars. The Department uses these rates along with other economic information to develop inflation rate information tailored to specific types of projects. Then-year dollars are used in the budget and other baseline documents. Computation of the inflation premium, while complex, is purely mechanical. These inflation factors are usually published in January each year. A sample escalation table follows, as shown in Table 8-1 below.

Many things need to be considered when building a project budget. For each of the various project elements, factors such as work content, time-phasing, expected costs, and the proper appropriation to be used need to be determined. For each appropriation requested, the relevant funding policy (annual, incremental, or full funding) must be applied and any exceptional circumstances to properly time-phase the budget request must be considered. In addition, you must ensure that the correct escalation indices are applied to convert cost estimates prepared in base-year dollars to budget estimates submitted in then-year dollars.

Table 8-1. Escalation Rate Assumptions For DOE Projects (January 2003)

	Project Categories									
FY	**Construction**		**EM**		**IT**		**O&M**		**R&D**	
2002	1.000	N/A	1.000	N/A	1.000	N/A	1.000	N/A	1.000	N/A
2003	1.021	2.1	1.020	2.0	1.008	0.8	1.018	1.8	1.023	2.3
2004	1.046	2.5	1.047	2.7	1.017	0.9	1.045	2.6	1.051	2.8
2005	1.076	2.9	1.075	2.7	1.022	0.5	1.073	2.7	1.080	2.7
2006	1.106	2.8	1.103	2.6	1.032	1.0	1.101	2.6	1.108	2.6
2007	1.135	2.6	1.130	2.4	1.041	0.8	1.127	2.4	1.136	2.5
2008	1.164	2.6	1.157	2.4	1.049	0.8	1.154	2.4	1.164	2.5

EM = Environmental Management; IT = Information Technology; O&M = Operations and Maintenance; R&D = Research and Development.

8.6 PROJECT ENGINEERING AND DESIGN FUNDS

Project Engineering and Design (PED) funds are requested using a Project Data Sheet as "design only" funds for preliminary and final design. PED funds are not to be used for construction, long-lead procurement, or major equipment items. PED funding requests are developed from historical data or parametric estimates. The objectives for the use of PED funds are to:

- Improve the accuracy of the project cost estimate and support establishment of the Perfromance Baseline
- Improve the DOE's planning, programming, and budgeting process for the acquisition of projects
- Provide funds for VM activities (see OMB A-11, Section 5.3.4, and FAR).

Acquisition planning, the acquisition strategy, and Critical Decision processes play important roles in the PED process.

Critical Decision-0 determines if a capital asset is required and the date by which it will be provided. That requirement date, together with the project's risk assessment, projected construction uncertainties, equipment lead times, funding constraints, and other related factors, will determine when to request PED funds. PED requests should be confirmed and updated as part of the Critical Decision-1 process.

8.7 Key Documents

Two key documents used to integrate projects with the PPBE are Project Data Sheets and OMB Exhibit 300s. Both documents provide key information to OMB and Congress.

Capital Asset Plan (OMB Exhibit 300) requires information that demonstrates the capital programming and capital planning and investment control policies defined in OMB Circular

A-11, Preparation, Submission and Execution of the Budget. The Capital Asset Plan documents the Performance Baseline and communicates the performance of projects; demonstrates a direct connection to the agency's strategic plan; a positive return on investment for the selected alternative; sound acquisition (program and procurement) planning; comprehensive risk mitigation and management planning; and realistic cost and schedule goals and measurable performance benefits. OMB requires the submission of the exhibits twice a year, but recommends it be continually updated for internal use as new project information comes available. Detailed guidance on the preparation of OMB Exhibit 300s is provided in Circular A-11, Part 7, *Planning, Budgeting, Acquisition and Management of Capital Assets*.

Project Data Sheets are the primary documents used to identify funding for capital asset projects requiring capital funds throughout the budget formulation process. Programs submit a Project Data Sheet for new project efforts and ongoing projects that require Congressional authorization or appropriation in the Budget Year. The Project Data Sheets contain the description, cost and schedule data defining the project. Detailed guidance on preparing a Project Data Sheet is contained in the *Budget Formulation Handbook.* The Project Data Sheet must match the data in the Capital Asset Plan.

CHAPTER 9. PROJECT REVIEWS

9.1 INTRODUCTION

Reviews are part of the planning process and are used to assist the Project Director and upper-level management in developing project plans and verifying that the project will satisfy the mission needs. Reviews provide information to help make decisions, and demonstrate and confirm a project's accomplishments at various stages. The objectives of reviews include:

- Ensure readiness to proceed to a subsequent project phase.
- Ensure orderly and mutually supportive progress of various project efforts.
- Confirm functional integration of project products and efforts of organizational components.
- Enable identification and resolution of issues at the earliest time, lowest work level, and lowest cost.
- Support event-based decisions.
- Control risk.

Reviews communicate information on current status, progress, completeness, correctness, or work completion. Reviews include users, suppliers, contractors, managers, stakeholders, and peers. Under the direction of the Project Director, the project should involve the user in organizing, scheduling, and presenting project reviews. One or more of the following broad categories of reviews are performed in support of DOE projects:

- *Regular/Periodic*. Involves project status, trends, design and construction progress for systems and interfaces. These include monthly reviews, quarterly reviews, peer reviews for development work, etc. All are an integral part of ongoing project activities.
- *Special Areas of Concern*. Involve critical technology, hazards, special procurements, etc. Some of these reviews can be planned and budgeted in advance, others will be on an as-needed basis.
- *Event-Driven*. Includes mission need reviews, Performance Baseline validation reviews, and construction or execution readiness reviews. These reviews support the decision to proceed to follow-on project phases.
- *Unscheduled*. Could involve the General Accounting Office, Defense Nuclear Facilities Safety Board, DOE Headquarters, or the user. Generally performed on projects with high Congressional visibility or projects that experience schedule or cost difficulties.
- *Status Reviews*. Performed to determine the current condition of a project or activity, such as progress towards completion, compliance status, or readiness to proceed.

Reviews could include items (project baseline, requirements, subsystem, or the project end product) or activities (planning, design, or construction). These reviews can involve management and/or the user. Products from these reviews include review plans, review reports, action item lists, and action item resolution reports.

- *Technical or Design Reviews*. Technical or design reviews determine if a product (drawings, analysis, or specifications) is correct and will perform its intended functions or meet requirements. These reviews are typically peer or internal reviews and may be an integral part of the project test and evaluation effort.

Reviews are an important project activity and should be planned as an integral part of the project, based on project complexity, duration, and Critical Decision points.

This chapter provides an overview of various project reviews that may occur during the life cycle of a project.

9.2 PROJECT (PROGRAM) MANAGEMENT REVIEWS

Project (program) management reviews to senior leadership are performed quarterly and also when the project complexity, cost, or concerns warrant such a review. This review provides a forum to communicate status and ensure continued support from senior executives within the Department. For all projects, the appropriate Acquisition Executive is to conduct a quarterly project performance review with the Project Director and staff. The SAE, or Under Secretary or NNSA Administrator if so designated, conducts quarterly reviews of Major System projects. These reviews provide both information exchange and more detailed information than that provided in status reports. OMBE should be invited to participate in all project quarterly reviews. The contractor may participate in quarterly reviews as appropriate.

A performance review can take many forms; generally, the Project Director presents the current program/project status. Performance reviews allow the presentation of more specific and detailed project information than possible in a structured, formal status report. These meetings provide opportunities to respond to questions or concerns, discuss future actions and activities, identify needed user or contractor support, and discuss actions or decisions by external entities influencing the project (e.g., Office of Management and Budget, the U.S. Environmental Protection Agency, Congress, Defense Nuclear Facilities Safety Board). Finally, the reviews provide a forum for identifying, discussing, and resolving issues (or assigning actions) before issues become a problem.

9.3 INDEPENDENT REVIEWS

Independent reviews are an important project management tool and serve to verify the project's mission, organization, development, processes, baselines, progress, etc. Reviews may be initiated internally by the project to provide assurance of a particular technology or other facet of the work, or may be conducted by an external, non-advocate organization. Reviews may be scheduled or unscheduled to meet a specific objective or need, such as a budget validation or a Critical Decision request. The scope of a review is dependent on the cost/complexity of the project and its current status. Non-proponents of the project conduct independent reviews.

9.3.1 Independent Project Reviews

Reviewers from within the Department, but outside of the specific program and project being reviewed, conduct an Independent Project Review. The Deputy Secretary as the SAE, or the Program Secretarial Officer, the Operations/Field Office Manager, Program Managers, and Project Directors can request, authorize, or conduct Independent Project Reviews as required. The OMBE is included as an invited observer for all planned reviews. OMBE coordinates the extent of their participation with the appropriate organization on a case-by-case basis.

9.3.2 External Independent Reviews

External Independent Reviews are performed by OECM with reviewers from outside of the Department. The scope and schedule are and coordinated with the program and project staff. One of the most common types of External Independent Reviews is the Performance Baseline External Independent Review that is utilized to support validation of the Performance Baseline on all projects. A second common type is the Construction/Execution Readiness External Independent Review that supports Critical Decision-3 for Major System Projects.

9.3.3 Independent Cost Reviews

Independent Cost Reviews are used primarily to verify project cost and schedule estimates and support the Critical Decision-2 process in establishing project performance baselines. Independent Cost Reviews are part of the Performance Baseline External Independent Review. However, an Independent Cost Reviews or even an Independent Cost Estimate may be requested at other times for other reasons. The OMBE functions as DOE's agent to establish contracts for Independent Cost Reviews. Independent Cost Reviews are documented in formal reports submitted to the Program Office and Acquisition Executive by OMBE.

9.4 SPECIFIC TYPES OF PROJECT REVIEWS

This section provides an overview of the various reviews that may occur during a project life cycle. Table 9-1 provides a summary of the reviews and responsible organization.

Table 9-1. Types of Project Reviews

Review Title	Accomplished Prior to:	Required or Optional	Responsible Organization	Type of Review
Mission Need	CD-0	Optional	PSO/Deputy Administrator	IPR
Alternative Selection and Cost Range	CD-1	Optional	PSO/Deputy Administrator	IPR
Performance Baseline	CD-2	Required	OECM	EIR
Construction or Execution Readiness	CD-3	Required for Major System Projects, Optional for non-MS Projects	OECM for MS projects, PSO for non-MS projects	EIR for MS projects, IPR for non-MS projects

CD = Critical Decision; PSO = Program Secretarial Officer; IPR = Independent Project Review; EIR = External Independent Review; MS = major system.

9.4.1 Mission Need Review

This is an optional Independent Project Review focused on the initial planning for the project and development of the Mission Need Statement.

Scope of Review

Key review elements for a Mission Need Review are:

- *Mission Need Statement.* Assess adequacy of documentation confirming that the new project provides a specific capability that the Department currently lacks to meet its assigned mission.

- *Program/Mission Requirements*. Assess whether high-level requirements are sufficiently defined to identify potential alternatives (to be analyzed in the next phase) that are both applicable and capable of meeting project goals.

- *Total Project Cost and Schedule Ranges*. Review basis of the rough order of magnitude cost range and provide an assessment of whether this range reasonably bounds the cost and schedule of alternatives to be analyzed in the next project phase. Review basis of schedule range and assess whether the schedule is consistent with strategic requirements for when this project is required. Also, for projects closely linked to other projects, assess whether schedule results in appropriate integration.

Required Documentation

- Mission Need Statement

- Program Requirements Document

- Rough order of magnitude cost ranges and schedule

9.4.2 Alternative Selection And Cost Range Reviews

This is an optional Independent Project Review that focuses on the analysis supporting the selection of the preferred alternative, ensuring the system functions and requirements are defined, and the preliminary cost and schedule range. The Acquisition Strategy is also an integral part of the review.

Scope of Review

Key review elements for an Alternative Selection and Cost Range Review are:

- *Alternative Analysis*. Assess whether the alternative selection process evaluates a full range of appropriate attributes for each alternative including life-cycle cost, stakeholder values, reliability, operability, and maintainability, safety, technology development requirements, project risks, and regulatory requirements. Assess whether the decision analysis process for recommending a preferred alternative is reasonable and comprehensive.

- *System Functions and Requirements*. Assess whether functions and requirements are provided in sufficient detail and definition such that the preliminary design can be initiated with a clear and unambiguous statement of work. The requirements should also be sufficiently defined to allow value engineering to be used to optimize the system.

- *Acquisition Strategy*. Assess whether the acquisition strategy has considered the full range of acquisition alternatives, and reasonably represents best value to the government.

- *Risk Management*. Assess whether the key risks for the recommended alternative have been fully identified with sound mitigation strategies defined. Also assess whether the preliminary cost and schedule estimates reflect cost and schedule contingency needed to address risks.

- *Hazard Analysis*. Assess whether the hazard analysis is comprehensive and identifies all key hazards and corresponding safety Structures, Systems, and Components needed to be incorporated into the preliminary design.

- *Preliminary Cost and Schedule Estimates*. Review basis of preliminary cost and schedule estimates for reasonableness and executability.

Required Documentation

- Conceptual Design Report (including Alternative Analysis, Hazard Analysis, site selection criteria, NEPA documentation, system functions and requirements, preliminary cost and schedule estimates)

- Risk Management Assessment

- Safety Documentation

- Acquisition strategy

9.4.3 Performance Baseline Review

This is an External Independent Review performed by OECM for all projects greater than $5 Million. The primary purpose of this review is to support OECM's validation of the Performance Baseline, and provide reasonable assurance that the project can be successfully executed.

OECM is responsible for developing and finalizing the scope for all Performance Baseline Reviews. The draft scope of work will be provided to the Program Secretarial Officer/ Deputy Administrator's support office one week after the receipt of the Core Documentation (see below). This will allow OECM and their review team time to identify specific activities to be covered in the review. The project management support office and/or Program Secretarial Officer support staff, as appropriate, will have one week to review, comment, and provide recommendations on the scope of the review for OECM consideration. The final Performance Baseline Review scope will be issued by OECM one week prior to the review start date.

Scope of Review

Key review elements for a Performance Baseline Review are:

- *Resource Loaded Schedule*. For selected Work Breakdown Structure elements (typically, those constituting significant cost and/ or risk), summarize the detailed basis for the cost estimate and schedule duration. Assess the method of estimation and the magnitude for each Work Breakdown Structure element reviewed. Identify and assess key cost and schedule assumptions and evaluate the reasonableness of these assumptions as related to the quality of the cost and schedule estimates. Identify specific work activity that constitutes project completion and whether these completion activities are sufficiently well defined. Include an assessment of whether the project completion activities are consistent with DOE guidance for work to be included/ excluded from the Project. Assess whether the project funding profile is consistent with the resource loaded schedule.

- *Total Project Cost and Project Schedule*. Provide an independent evaluation of the Total Project Costs and overall Project Schedule. Discuss whether the Total Project Cost and schedule are reasonably consistent with similar DOE and/or other government/industry type projects. As part of this work, assess whether the Total Project Costs include all costs necessary for completion including startup and "hot" testing, as appropriate.

- *Work Breakdown Structure.* Assess whether the Work Breakdown Structure incorporates all project work, and whether it represents a reasonable breakdown of the project work scope. Assess whether the resource loaded schedule is consistent with Work Breakdown Structure for the project work scope.

- *Risk Management*. Determine if risks have been identified and properly classified as high, medium, and low. Assess whether appropriate risk mitigation actions have been incorporated into the baseline.Assess whether adequate contingency has been included in Total Project Costs and Schedule. Describe the approaches used to determine risk and assess adequacy.

- *Preliminary Design and Design Review*. Evaluate adequacy of preliminary design including adequacy of drawings and specifications, and assess whether they are consistent with system functions and requirements. Assess whether all safety Structures, Systems, and Components are incorporated into the preliminary design. Review results of the preliminary design review and assess whether additional work identified in the design review has been incorporated into the Performance Baseline.

- *System Functions and Requirements*. Assess whether "design to" functions and requirements are reflected in the baseline, including safety and external requirements such as permits, licenses, and regulatory approvals. Evaluate whether system requirements are derived from and consistent with Mission Need.

- *Hazards Analysis*. Evaluate the quality of the Hazard Analysis and assess whether all scope, schedule, and costs necessary for safety are incorporated into the baseline. Review the classification of SSCs as safety class or safety significant. Assess the Hazards Analysis process, including the use of internal and external safety reviews. Review any

Defense Nuclear Facilities Safety Board and/or Nuclear Regulatory Commission interface and discuss the status of their involvement.

- *Value Management/Engineering*. Assess the applicability of Value Management/Engineering, and whether a Value Engineering analysis been performed with results being incorporated into the baseline. Also provide an assessment of the Value Engineering process for this project.

- *Project Controls/Earned Value Management System*. Assess whether all project control systems and reporting requirements will be in place prior to Critical Decision-2. For projects where Earned Value Management System is not required, assess the adequecy of an alternate project control system for monitoring and controlling project costs and schedules.

- *Project Execution Plan*. Review the Project Execution Plan and determine if it reflects and supports the way the project is being managed, is consistent with the other project documents, and establishes a plan for successful execution of the project.

- *Acquisition Strategy*. Review the Acquisition Strategy to determine if it is consistent with the way the project is being executed. The Review Team should evaluate any changes from Critical Decision-1 that may impact whether the current strategy represents best value to the government.

- *Integrated Project Team*. Assess whether the project management staffing level is appropriate, and determine if appropriate disciplines are included in the Integrated Project Team. Identify any deficiencies in the Integrated Project Team that could hinder successful execution of the project. Required Documentation

The following documents should be provided to OECM prior to the review. Other associated material may be requested by the Review Team to ensure a complete and accurate review is performed.

- Detailed Resource Loaded Schedule
- Detailed Cost Estimate
- System Functions and Requirements Document (also referred to as the “Design-to” requirements or Design Criteria)
- Results of and Responses to Site Preliminary Design Review
- Project Execution Plan
- Hazards Analysis
- Risk Management Assessment
- Acquisition Strategy

Performance Baseline Review Process

The specific duration of the Performance Baseline Review depends on the size and complexity of the individual project being reviewed. The typical process for conducting this review follows:

- The respective Project Management Support Office and/or Program Secretarial Office support staff, as appropriate, notifies OECM that the project is ready for a Performance Baseline Review.
- The Performance Baseline Core Documentation is provided to OECM.
- OECM provides the Project Management Support Office and/or Program Secretarial Office support staff a draft of the review scope for review and comment.
- The Project Management Support Office and/or Program Secretarial Office support staff provides comments and recommendations on the scope of the review.
- OECM finalizes the scope of the review and provides it to the Project Management Support Office for distribution to the program and the site project team.
- The External Independent Review Team conducts the review ending with an Outbrief to the Site Project Team.
- OECM issues the draft report to the Project Management Support Office, Program, and Site Project Team for a factual accuracy review.
- OECM incorporates comments, as appropriate, and issues the Final Report with recommended corrective actions to the Project Management Support Office, the Program, and the Site Project Team.
- The Site Project Team finalizes the Corrective Action Plan and forwards it to the Program and Project Management Support Office for review and approval by the designated approval authority. The approved Corrective Action Plan is then provided to OECM.
- OECM uses the External Independent Review Final Report, in combination with any corrective actions taken by the site, to assess whether the Performance Baseline can be validated.
- OECM forwards the results of the Perfromance Baseline Review, including OMBE's determination on the validity of the baseline, to the Program Secretarial Officer/NNSA Deputy Administrator and the Acquistion Executive, as appropriate.

Tailoring Performance Baseline Reviews

Tailoring is an essential component of the Performance Baseline Review Process. Tailoring can apply to any project, but has increased applicability to projects that are considered to be routine in nature, such as traditional construction projects, and have relatively low risk. The key

requirement for tailoring the Performance Baseline Review is the ability of OECM to validate the Performance Baseline. The tailoring action may include:

- Use of summary level Resource Loaded Schedules
- Use of summary cost and funding documents
- Conducting limited interviews with selected members of the Integrated Project Team over the telephone or in a videoconference
- Reviewing key documents with minimal site visit, if any
- Reducing the core scope of review requirements

9.4.4 Construction or Execution Readiness Review

The purpose of the Construction or Execution Readiness Review is to assess the readiness for construction or implementation and to confirm the completeness and accuracy of the Performance Baseline. Construction/Execution Readiness External Independent Reviews are conducted by OECM for all Major System projects. Construction/Execution reviews for non-Major System projects conducted by the Program Secretarial Officer and are optional. The core scope has several elements relative to construction readiness, but retains many of the elements contained in the Performance Baseline Review.

Core Scope of Review

- *Final Drawings and Specifications*. Assess completeness and quality of drawings and design specifications. This is typically accomplished by reviewing selected construction elements or systems, including the key project elements posing the more difficult construction challenges. Assess whether bid packages are sufficiently clear and well defined as to be ready for bid.
- *Construction/Execution Planning*. Assess adequacy of construction/project execution planning and staffing. Assess logistics including interface with operating facilities, infrastructure interfaces, adequacy of lay-down areas, temporary construction facilities, security and badging readiness, and other logistical elements. Federal and contractor staffing should also be reviewed to ensure adequate oversight of the work, including safety, performance, and quality.
- *Resource Loaded Schedule*. Review the Resource Loaded Schedule to ensure that it is consistent with the approved Performance Baseline with no changes to the Total Project Cost and completion schedule. Also assess the reasonableness of the schedule relative to the critical path.
- *Final Design Functions and Requirements/Site Final Design Review*. Assess whether all functions and requirements are reflected in the Performance Baseline including safety Structures, Systems, and Components and external requirements such as permits,

licenses, and regulatory approvals. Assess whether all required changes from the Site Final Design review are incorporated into the Performance Baseline.

- *Risk Management*. Assess whether the risk assessment has been updated, as appropriate, to address any new risks identified in final design. Assess whether cost and schedule contingency remains sufficient for project risks.

- *Value Management/Engineering*. Assess the application of Value Management/Engineering during Final Design, and if results have been incorporated into the Performance Baseline.

- *Project Controls/Earned Value Management System*. Assess whether all project control systems and reporting requirements are in place and being used to monitor and report performance.

- *Acquisition Strategy*. Review the Acquisition strategy to determine if there have been any significant changes and if the acquisition approach continues to represent the best value to the government.

- *Project Execution Plan*. Review the Project Execution Plan and determine if it reflects and supports the way the project and construction effort is being managed. It should be updated to reflect any changes as a result of Final Design and be consistent with the other project documents.

- *Integrated Project Team*. Assess whether staffing level is appropriate and determine if appropriate disciplines are included in the Integrated Project Team. Identify any deficiencies in the Integrated Project Team that could hinder successful construction execution.

Core Documents Required

- Final Design Drawings and Specifications
- Results of and Responses to Site Final Design Review
- Project Execution Plan
- Construction Planning Document
- Detailed Resource Loaded Schedule
- Detailed Cost Estimate
- System Functions and Requirements Document
- Risk Management Assessment
- Safety Documentation
- Acquisition Strategy

9.5 TECHNICAL REVIEW

Technical reviews are necessary when there is uncertainty in the outcome of a project effort. If a design is new, untried, or unproven, and no standards against which judgments regarding viability can be made, then a review by appropriately trained and knowledgeable peers is in order. Specific types of reviews can include:

- Alternative Systems
- Constructability
- Functions and Requirements
- Preliminary Design
- Detailed Design
- Technology
- System Verification
- Physical Configuration
- Test Readiness
- Functional Configuration
- Operability and Reliability, Availability, and Maintainability.

9.6 OPERATIONAL READINESS REVIEW

Although titled a review, an Operational Readiness Review is not a project review in the normally accepted use of the term. Rather, an Operational Readiness Review is an in-depth independent evaluation of the readiness of completed facilities, systems, equipment, procedures, personnel, and supporting and interfacing systems and organizations to begin facility operation. In the case of a facility project, the review focuses on the readiness details associated with turning the facility over to the user, including final startup, testing and balancing mechanical systems. For Disposition or Environmental Restoration Projects, the review focuses on the details of the decontamination and demolition or clean-up specifications. Because of the importance of this activity, Operational Readiness Review planning is initiated early in a project's life cycle.

CHAPTER 10. PERFORMANCE BASELINE

10.1 INTRODUCTION AND KEY TERMS

Acquiring assets is not an end unto itself. It is an essential element that helps to fill a performance gap in our ability to meet strategic goals. The assets we acquire must be able to perform necessary functions that facilitate meeting the strategic goals and objectives. Buildings, accelerators, productions facilities, waste treatment facilities, etc., are all built for a specific purpose and are designed to perform specific functions. It is the definition of these specific functions that forms the core of the Performance Baseline. During the concept development process, key performance parameters define and document how the asset must perform to meet the need. Together with the defined cost and schedule they form the Performance Baseline— the capability that we commit to develop at a specific cost within a specified schedule

The Performance Baseline is an essential element in the acquisition process. It is the Department's means of obtaining corporate performance commitments and approval for a project from the entire acquisition organization and Congress. All acquisition projects will establish a Performance Baseline that is approved by the Acquisition Executive as a part of Critical Decision-2.

Following are the key terms used in this chapter.

- Key Parameters
- Objective Value
- Performance Baseline
- Threshold Value

10.2 KEY PARAMETERS

The Performance Baseline is defined by key performance, scope, cost and schedule parameters. Key parameters are often defined in terms of that which is desired and that which is required. Stated another way, the parameters are values that have desired objectives and a minimum thresholds. The *objective value* is the desired performance, scope, cost or schedule that the completed asset should achieve, whereas the *threshold value* is more conservative and represents the minimum acceptable performance, scope, cost or schedule that an asset must achieve. The objectives and thresholds form the boundary condition within which the project managed to completion – striving to meet the objectives, but achieving at least the minimum thresholds. The

space between the objectives and the thresholds is normally referred to as the "trade space." The Integrated Project Team can trade within this space to maintain the performance, scope, cost and schedule requirements. In other words, performance can be traded off to control cost. However, trade offs must never compromise the threshold values which are the minimum required to meet the mission and form the essence of the commitment to Congress.

These key performance, scope, schedule, and cost parameters define the necessary elements of a Performance Baseline. The Performance Baseline parameters are those that, if they cannot be met, would require the Acquisition Executive to re-evaluate the concepts, design approaches, and acquisition strategy for an acquisition. The Performance Baseline key parameters should represent the project as it is expected to be completed. A project's Performance Baseline should include sufficient key performance, scope, schedule, and cost parameters to clearly establish the capabilities being acquired, the schedule for the acquisition, and the total cost to acquire that capability.

10.2.1 Performance Parameters

The key performance parameters should define how the asset will perform when it is completed. The total number of key performance parameters should be the minimum number needed to characterize the required functionality but must clearly establish the capabilities being acquired. A key performance parameter is a characteristic, function, requirement, or design basis that, if changed, would have a major impact on the system or facility performance, scope, schedule, cost and/or risk; or, the ability of an interfacing project to meet its mission requirements. Appropriate parameters are those that express performance in terms of accuracy, capacity, throughput, quantity, processing rates, purity, or others that define how well a system, facility, or other project will perform. Examples include:

The Pit Disassembly and Conversion Facility shall be capable of processing 35 metric tons of plutonium metal over 10 years of operation.

The high-level waste vitrification system shall be capable of 100 kilograms per hour of qualified chemical makeup; containing 40 weight percent high-level waste running on average 2/3 of the time.

The Tritium Extraction Facility shall be capable of extracting and processing tritium-containing gases from irradiated tritium-producing burnable absorber rods from a Commercial Light Water Reactor and delivering from 2.5 to 3 kilograms of tritium per year.

The Research Office Building shall be capable of housing 300 scientists, engineers, and other support personnel.

The Business Projection System will provide the capability to handle 1000 users at all times, have a response time of no longer than 7 seconds, and be online 99.9 percent of the time. However, redundancy need only be available 85 percent of the time.

The key performance parameters are identified during the concept development phase. They are defined as a result of the analysis which leads the program to the conclusion that a particular concept is the appropriate solution that will meet the required need. Early in the project, the parameters may be stated in fairly general terms. As the concept evolves, the parameters become more specific, and reflect the minimum and/or maximum acceptable performance for the system at completion. The total number of performance parameters can be limited (generally to five or six), and may include parameters that drive effectiveness, efficiency, schedule, and cost.

In some cases, there may be a need to define the performance parameters in terms of a design, technical parameter, or specification. A situation may exist where an asset must be inter-operable with some other existing asset within the Department. In such a case, stating a performance objective may not be adequate to ensure that the delivered asset is compatible with other facilities, systems or functions. In these cases a more prescriptive specification may be required. When a detailed specification is required, it must be because performance parameters are inadequate to ensure that the end capability will meet the need.

10.2.2 Schedule Parameters

Schedule is a key parameter because there is an impact if the required completion date is not met. For instance, if remediation is not completed in accordance with a legal agreement, there may be financial penalties. If an office building is not available at a specified time it may result in additional costs to lease the required space. The unavailability of an instrument or system may cause experiments to be cancelled or delayed causing a ripple effect by delaying other experiments. Ultimately, a delay must have an impact on the programmatic mission and its ability to meet its strategic goals. If there is no impact then the mission need may be called into question.

The schedule parameters should include all phases of the project, major decision points, initial operation and other critical system events. The objective for schedule parameters should be the minimum date that is reasonably achievable. The threshold schedule should be the maximum schedule that can be tolerated without a significant impact. If the threshold values are not otherwise specified, the threshold value for the schedule should be the objective value plus 6 months for most projects.

Schedule parameters are established through an interactive process that proceeds integrally with the technical and cost processes. Critical path activities, events, milestones, and resources are developed using a disciplined approach and properly integrated with all other appropriate elements. Schedules are to reflect realistic, risk adjusted durations, and milestone events that mitigate risks identified during risk analysis.

10.2.3 Cost Parameters

The cost parameter is the total cost of the project, which will include the cost identified in the budget submission and appropriated by Congress directly for the project and other costs that are included in the programs operating budget. When there is more than one cost element, such as for Total Estimated Cost and Other Project Costs, both the Total Estimated Cost and Other Project Costs should be included along with the Total Project Cost as the cost parameter in the Performance Baseline. When there is only a single cost element, such as Operational Expense funded projects, then the cost parameter consists of that single element. The Total Project Cost must also include appropriate cost factors for contingencies.

10.2.4 Technical Scope Parameters

While the performance parameters define the required capability qualitatively in terms of how it will perform, the technical scope defines the capability quantitatively in terms of what the end product will be. The scope parameter will reflect the definition of the project that is generated in the conceptual and preliminary designs. The scope will be stated in quantity, size and other parameters that give shape and form to the project.

10.3 PERFORMANCE BASELINE PREPARATION

Preparing the Performance Baseline is dependent upon the type of project. When a project is not complex and requires minimal development, the definition of key parameters may be straightforward. This is especially true in buildings where the concept development phase may be abbreviated. For more complex projects, the key parameters are more difficult to define and may not be finalized until later in the preliminary design process. The key is to develop a Performance Baseline that is fully achievable. The trade space between the threshold and the objective provides flexibility to manage risk. Contingency and schedule float or slack provide additional flexibility in meeting the minimum Performance Baseline identified as the threshold. Trade offs between the three elements allow project adjustments to accommodate unknowns and uncertainty.

The development and documentation of the Performance Baseline, which represents the required capability, evolves as the mission need and requirements analysis processes evolve. The preliminary parameters may only be able to define the objective or even the threshold. The Performance Baseline continues to mature during conceptual and preliminary design until all issues are resolved and all key parameters have been determined. The Performance Baseline is developed prior to Critical Decision-2— Approve Performance Baseline. Some projects may be able to define the Performance Baseline very early. This may be especially true in general use facility (buildings), such as office buildings or other projects where the concept is well defined early in the project.

The Performance Baseline is documented in the Project Data Sheet and the Capital Asset Plan (OMB Exhibit 300) during the budget submission process. The Performance Baseline is also

entered in the Project Assessment and Reporting System. The documented Performance Baseline threshold parameters comprise the official Performance Baseline. Both the threshold and objectives may be documented to be complete. However, the thresholds are the minimum parameters against which the project's performance is measured when complete.

10.4 PERFORMANCE BASELINE DEVIATION

A Performance Baseline deviation occurs when the current performance, scope, schedule, or cost parameters cannot be met. The Project Director should ensure line management is promptly notified whenever the project performance measurement system indicates the likelihood of a deviation. The factors surrounding the anticipated deviation and any planned corrective actions should be thoroughly addressed in monthly reports and during quarterly performance reviews and should be annotated in the Project Assessment and Reporting System. When it is apparent that the corrective actions will not succeed in bringing a project back within the Performance Baseline the Program Secretarial Officer/Deputy Administrator and OMBE should be promptly notified.

Within 90 days of the notification to the Program Secretarial Officer/Deputy Administrator, one of the following should have occurred:

- A new Performance Baseline (changing only those parameters that deviated and/or are unexecutable) will have been approved by the appropriate Acquisition Executive.

- A Program Secretarial Officer/Deputy Administrator -level project review will have been conducted with a recommendation on a course of action.

- A path forward should been presented to, and approved by, the Program Secretarial Officer/Deputy Administrator that includes the schedule for all reviews and actions required to evaluate the project status and develop a new Performance Baseline.

In conducting the review, the Program Secretarial Officer/Deputy Administrator should determine whether there is a continuing need for a project that is behind schedule, over budget, or cannot reach its minimum performance or scope threshold. A specific determination must be made by the SAE for Major System projects, and the Program Secretarial Officer/Deputy Administrator NNSA for non-major system projects, whether to terminate the project or change the Performance Baseline.

Any deviation that is a result of legislative or executive action, such as an appropriation act that modifies the funding or otherwise makes a constructive change in the project, should be deemed a programmatic baseline change or a directed change. All such changes should be documented and administratively approved by the appropriate Acquisition Executive.

Subsequent to the action, any approved change in the Performance Baseline will be updated in Project Assessment and Reporting System, and when applicable, during the next budget cycle, in

the Project Data Sheet and the Capital Asset Plan. Programmatic baseline changes will not be statistically recorded as deviations and should not be reported negatively in the monthly reports; however, parameter changes should be reflected in updates.

CHAPTER 11. CHANGE CONTROL

11.1 INTRODUCTION AND KEY TERMS

Change control ensures that project changes are identified, evaluated, coordinated, controlled, reviewed, approved, and documented in a manner that best serves the project. Errors, problems, opportunities, new management, or the availability of new methods or tools can trigger project changes. Uncontrolled changes lead to chaos due to the far-reaching effects that even small changes can have on the project's technical, scope, schedule, and cost baseline, as well as effects on safety, risk, quality, and products.

An approved project Performance Baseline is the highest controlling element of a project. Controlling changes within the Performance Baseline should be an inherent element of project management that is directly related to the risks and uncertainties associated with a project. One key goal of change control is to ensure Performance Baseline threshold values are not exceeded. Change control provides a system to approve and document project changes.

The goals of a change control process include:

- Anticipate, recognize, and predict changes
- Prevent Perfromance Baseline deviations
- Evaluate and understand the impacts of each change
- Identify, understand, and control the consequences of changes
- Prevent unauthorized or unintended deviations from approved baselines
- Ensure each change is evaluated, reviewed, and dispositioned at the proper management level

Key terms used in this chapter include the following.

- Change Control Board
- Energy Systems Acquisition Advisory Board

11.2 CONTROLLING CHANGES

Change control is to be established early in a project's life cycle, and as a minimum, be formal, organized, and functioning prior to requesting Critical Decision-2. The objective of the change control process is to ensure that changes are documented and formally resolved. Documenting and controlling changes provides better mitigation, is necessary for Earned Value Management System and for accurate performance reporting, and supports better decision making. The change

control process is not intended to simply prevent changes, but ensures change control review and documentation. Therefore, changes are managed and controlled by establishing a process for identifying, evaluating, and dispositioning change requests.

11.2.1 Change Principles and Processes

Responsibility for change control exists at every management level and changes are monitored at the appropriate level by Change Control Boards. However, regardless of the source or the seeming innocence of a change request, the Project Director should be ultimately responsible for ensuring requested changes are documented, evaluated, processed, and dispositioned.

11.2.2 Input to Change Requests

A change control framework should be established or referenced in the Project Execution Plan. The Project Execution Plan also identifies the overall Performance Baseline, and the individual technical, schedule and cost baselines, against which changes are monitored and controlled.

Once a technical baseline has been established, formal configuration management and documented engineering change requests are used to manage the baselines. Engineering changes should be evaluated for impact on schedule and cost baselines. When these baselines are impacted the change should be processed through appropriate change control. During design, change requests may be used to document and disposition minor design errors/changes. During construction, field change requests may similarly be used to disposition minor field errors/changes. These methods of initiating changes should be monitored, controlled, and approved based on a tailored change control process. In addition, all such changes should be reflected in approved project drawings and specifications.

11.2.3 Change Control Board

Each organizational level (as appropriate and documented in the Project Execution Plan) should establish a Change Control Board for disposition of baseline change proposals within their level of authority/control. For the SAE, the Energy Systems Acquisition Advisory Board may act as a Change Control Board. A Change Control Board includes, as a minimum, a chairperson, a secretariat, and members and advisors as needed. The Change Control Board chairperson should be responsible for change decisions, and is the change approval authority. Members and advisors are on the Change Control Board to advise the chairperson about technical matters involving quality, reliability, financial, schedule, environmental, safety, health, and quality issues. Board meetings and decisions should be documented through meeting minutes and letters-of-decision. Procedures for establishing a Change Control Board and defining the membership, authority, and operation of the Board should be included in the Change Control Board charter or initiating document.

11.2.4 Control Levels

Agreed-upon approval thresholds specify the control each organizational element has over baseline change approval, and the change control process. The baseline objectives, Performance Baseline threshold values, and associated change control thresholds for each project should be

documented in the Project Execution Plan, and approved at the Critical Decision-2 decision point. Change approval thresholds for changes within the Performance Baseline will range from the contractor to the Acquisition Executive. The SAE and Under Secretary/NNSA Administrator retain specific approval authority for technical, schedule and cost changes to the Performance Baseline for both Major System projects and non-Major System projects.

11.2.5 Change Initiation

The initiator of a change proposal prepares the change request describing the change and identifying the amount of budget required or to be returned. The initiator also describes the scope of the change, any schedule impacts resulting from the change, and provides an analysis of the change. The analysis of a change should include the impact of the change on project technical, scope, schedule, and cost baselines and/or forecasts, as applicable. Included in the technical category are items such as safety, quality, procurement, performance, personnel, training, ongoing operations, etc. The analysis is to be all-inclusive and thorough. A proven, structured approach for evaluating the impacts of a proposed change is obtained by completing a pre-established project change impact checklist for each change request. Change analysis and understanding is especially important during project execution because of the large impact of seemingly small changes.

Each project should establish and maintain a change control log from which a specific number is assigned to each change request, and in which the title, scope, and cost of the change is recorded, along with the disposition of the change and any assigned action items. If the change impacts project costs, then entries should also appear indicating the source of the funds needed to implement the change.

Often, a project change is caused by Congressional action, such as an Appropriations Act that reduces funding. These changes are classified as Directed Changes. In such cases, the Project Director should prepare a project change request and submit it through normal channels for review and approval.

11.2.6 Change Documentation

A significant amount of documentation can be associated with a project's change control system. This includes the change request and the change impact evaluation form; the change log; the Change Control Board meeting minutes, and decision documents; and any budget, funding, schedule, design, procurement, construction, safety, etc. documentation. These documents should be preserved as part of the project's historical record, and should be identified, reproduced, distributed, filed, and preserved in compliance with the project's configuration management system.

CHAPTER 12. EARNED VALUE MANAGEMENT

12.1 INTRODUCTION

Earned value management is a system that allows both government and contractor managers to have visibility into technical, cost, and schedule progress on their contracts. The implementation of an Earned Value Management System (EVMS) is widely recognized as a key component of program and project management. It ensures that cost, schedule and technical aspects of the contract are truly integrated. This chapter concentrates on the overall implementation of EVMSs and is not meant to provide an in-depth discussion of earned value principles and practices. Additional information on earned value is available from various texts and websites.

Key terms used in this chapter include the following.

- Earned Value
- Earned Value Management System
- Performance Measurement Baseline

12.2 MANAGEMENT NEEDS

A fundamental principle of effective project management is measuring and evaluating performance against an approved cost and schedule baseline. The implementation of an EVMS ensures management is provided with valid, timely, and auditable contractor cost and schedule performance information which:

- Relates time-phased budgets to specific contract tasks and/or statements of work
- Indicates work progress
- Properly relates cost, schedule, and technical accomplishment
- Provides managers with information at a practical level of summarization

12.3 MANAGEMENT SYSTEMS

In designing, implementing, and improving an EVMS, the objective is to provide managers with information needed to monitor, analyze, and control project performance and facilitate:

- Thorough planning
- Timely baseline establishment and control

- Information broken down by product as well as by organization or function
- Objective measurement of accomplishment against the plan at levels where the work is being performed
- Summarized reporting to higher management for use in decision-making
- Reporting discipline
- Analysis of significant variances
- Implementation of management actions to mitigate risk and manage cost and schedule performance

These are all inherent features of a good EVMS.

12.4 INDUSTRY STANDARD

Industry has long recognized the importance of earned value in program and project management, and the industry-developed ANSI/EIA 748-A-1998, Earned Value Management Systems defines 32 criteria for implementing earned value management. These 32 criteria have become the Department standard for EVMSs. The criteria are grouped into five major categories:

- Organization
- Planning, scheduling, and budgeting
- Accounting Considerations
- Analysis and Management Reports
- Revisions and Data Management

ANSI/EIA 748-A-1998 also contains a section on "Common Terminology" which provides definitions of the terms and concepts used to build and understand the application of EVMS. In addition, there is a section, "EVMS Process Discussion," to aid in the understanding and application of earned value management techniques. The additional sections of the standard provide a comprehensive and practical understanding of the principles of earned value management. This understanding, however, should be coupled with actual experience in the application of the principles and guidelines in a comprehensive business management system environment. The Department will publish a guide for implementing EVMS in the near future.

12.5 SYSTEM DESIGN AND DEVELOPMENT

EVMSs are subject to government acceptance, which may include contractor self-evaluation with government involvement, third party accreditation, or government review. In instances

where the system does not meet the intent of the criteria, the contractor must make adjustments necessary to achieve compliance.

Contractors have flexibility under the criteria approach to develop a system most suited to management needs. This approach allows contractors to use EVMSs of their choice, provided they meet the criteria. Acceptable EVMSs may range from fully Manual processes to totally automated systems.

When the solicitation document (request for proposal, request for quotation, etc.) specifies application of earned value criteria, the evaluation of proposals should include review of the prospective contractor's proposed system for planning, controlling, and reporting contract performance. The prospective contractor should describe the systems to be used in sufficient detail to permit its evaluation for compliance with the criteria.

Upon award of the contract, the EVMS description will be the basis upon which the contractor will demonstrate its application in planning and controlling the contract work. The government should rely on the contractors' systems when they are accepted and should not impose duplicative planning and control systems. Contractors having systems previously accepted are encouraged to maintain and improve the essential elements and disciplines of the systems.

The cost of implementing EVMS has defied quantification due to the difficulty in separating the incremental cost of EVMS from the normal management costs that would have been incurred in any case. Improper implementation imposes an unnecessary financial burden on the contractor and the government. Typical areas where cost could be mitigated include selecting the proper levels for management and reporting, variance analysis requirements, and the implementation of effective surveillance activities.

The criteria and associated reporting requirements have proven their value over many years. The criteria approach ensures that contractors have and use adequate management systems that integrate cost, schedule, and technical performance. This approach also provides better overall planning and control discipline on government contracts. The associated cost performance reports summarize objective data from contractors' internal systems for contractor and government managers. Substantive improvements in management can be achieved by senior management and the Project Director taking accountability for system effectiveness and use. A compliant system, properly used, ensures that valid cost; schedule and technical progress information provide the manager with an effective tool for decision making.

12.6 EARNED VALUE MANAGEMENT IMPLEMENTATION

The basic approach to implementing an EVMS includes:

- Correlating the project's technical, scope, schedule, and cost elements with the project Work Breakdown Structure

- Planning all work that the project is to complete

- Integrating technical, scope, schedule, and cost elements into a baseline plan at the work control account level against which performance (accomplishments) can be measured
- Objectively assessing accomplishments at the work performance (work package) level
- Analyzing significant variances from the plan and forecasting the impacts
- Providing data to higher levels of management for decisions, and for identifying and implementing corrective actions.

In designing, implementing, and improving an EVMS, the objective is to develop a capability that will provide accurate, reliable information to the contractors, government and other interested parties. The EVMS should accomplish this in a common, well-understood framework that facilitates communicating progress and performance as well as support course correction when a project goes off the path. An EVMS that complies with the standard will contain the characteristics of a good EVMS. Some of these characteristics include thorough planning; information broken down by organization and product; objective measurement of accomplishing tasks against the EVMS; summary of the level where work is performed, reported to management for use in decision making; improved reporting discipline; and implementation of management actions to manage risk, cost, and schedule performance. The responsibility for developing and complying with the standard resides with the performing organization, whether contractor or government.

When implementing the EVMS, contractors must be prepared to demonstrate compliance with the criteria and undergo a certification review by the Department. The certification authority for the Department is OMBE. A system description is usually used to document the system and should be available for the review. The objective of the review is for the Department and the contractor to jointly assess compliance with the standard. This will be accomplished by assessing specific areas, such as the contractor's planning, to ensure complete coverage of the statement of work, logical scheduling of the work activities, and adequate resources allocation.

Once an EVMS has been accepted, all significant proposed changes to the system should obtain concurrence to ensure that the certification is not compromised. The contractor should be able to provide access to all pertinent records and data requested by the Department or duly authorized representative. Access permits Department surveillance to ensure that the EVMS complies, and continues to comply with the criteria. The Department has entered into a memorandum of agreement with the Defense Contract Management Agency to conduct acceptance reviews in cooperation and coordination with the Department. The Defense Contract Management Agency is the executive agent for EVMS in the Department of Defense and provides EVMS support to the Department of Defense and other government agencies.

The Department intends to accept contractor EVMS when those systems were previously accepted or certified by the Defense Contract Management Agency as compliant. If the contractor proposes to use a system previously approved by the Department or other Federal agency, the project office, or program office should submit a memorandum to OMBE stating that the project will use a previously approved system, and include the particulars of that approval.

An EVMS that was previously approved for a small project may not be deemed as adequate for a Major System.

The contractor should provide information and assistance as required by the government to support review of the EVMS. If a contractor is responsible for an entire site location that requires execution of projects, a site certification may be requested and issued upon review or assessment.

12.7 CRITERIA CONCEPT

No single EVMS can meet every management need for performance measurement. Due to variations in organizations, projects, and working relationships, it is impractical to prescribe a universal system for cost and schedule control, relative to the scope of the contract. The criteria approach establishes the overall framework within which an adequate integrated cost/schedule/technical management system will fit.

The criteria provided in the standard provides the basis for determining whether a contractor's EVMS is acceptable. The criteria allow EVMSs to be adapted to fit the specific needs of various project and contract types. The criteria should be applied appropriately based on common sense and practicality, as well as sensitivity to the overall requirements for performance management. The procedures described in this chapter provide a basis to assist the government and the contractor in implementing an acceptable EVMS.

The criteria concept does not describe a system, nor does it purport to address all of the contractor's needs for day-to-day or week-to-week internal control, such as informal communications, internal status reports, reviews, and similar management tools. These management tools are important and should augment and be derived from the cost/schedule EVMS and should be an effective element of program and project management by both the contractor and the government.

The criteria represent the standards against which the validity of contractors EVMSs are assessed. The criteria approach continues to provide contractors the flexibility to develop and implement effective management systems tailored to meet their respective needs, while still ensuring fundamental earned value management concepts are provided. The criteria are reproduced below.

Organization

- Define the authorized work elements for the program. A work breakdown structure, tailored for effective internal management control, is commonly used in this process.

- Identify the program organizational structure, including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.

- Provide for the integration of the company's planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.

- Identify the company organization or function responsible for controlling overhead (indirect costs).

- Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures as needed.

Planning and Budgeting

- Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.

- Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

- Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Budget for far-term efforts may be held in higher level accounts until an appropriate time for allocation at the control account level. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost, including estimates for authorized but undefinitized work. On government contracts, if an over-target baseline is used for performance measurement reporting purposes, prior notification must be provided to the customer.

- Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.

- To the extent it is practical to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.

- Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.

- Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is unmeasurable or for which measurement is impractical may be classified as level of effort.

- Establish overhead budgets for each significant organizational component of the company for expenses which will become indirect costs. Reflect in the program budgets,

at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.

- Identify management reserves and undistributed budget.

- Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.

Accounting Considerations

- Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.

- When a work breakdown structure is used, summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements.

- Summarize direct costs from the control accounts into the contractor's organizational elements without allocation of a single control account to two or more organizational elements.

- Record all indirect costs which will be allocated to the contract.

- Identify unit costs, equivalent units costs, or lot costs when needed.

- For EVMS, the material accounting system will provide for—

  —accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques;

  —cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material; and

  —Full accountability of all material purchased for the program including the residual inventory.

Analysis and Management Reports

- At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system.

  —Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.

—Comparison of the amount of the budget earned the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.

- Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.

- Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.

- Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the contract.

- Implement managerial actions taken as the result of earned value information.

- Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.

Revisions and Data Maintenance

- Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.

- Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control.

- Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.

- Prevent revisions to the program budget except for authorized changes.

- Document changes to the performance measurement baseline.

12.8 PERFORMANCE MEASUREMENT BASELINE

The following discussion on the Performance Measurement Baseline has been developed to reduce the confusion with similar terms such as the Performance Baseline.

In earned value management, the assignment or allocation of budgets to scheduled segments of work produces a plan against which actual performance can be compared. This is called the Performance Measurement Baseline. The establishment, maintenance, and use of the Performance Measurement Baseline are indispensable to effective performance measurement. The Performance Measurement Baseline should be in place as early as possible after establishing the Performance Baseline that is approved at Critical Decision-2.

The relationship of individual work tasks with the time-phased resources necessary to accomplish them is established at the control account level. When practicable, all control accounts should be planned, at least at a summary level, to the end of the contract. Any control accounts that cannot be established in the initial planning effort, should have identified the critical event(s) necessary for turning planning packages into work packages and be monitored by the Integrated Project Team. Planning packages should be kept to a minimum. One of the signs of an immature project is a large number of planning packages when compared to work packages.

Note that the Performance Measurement Baseline shown in Figure 12-1 is not the overall Performance Baseline that is established for the project. The Performance Measurement Baseline is the baseline that encompasses all the work packages and planning packages. Management Reserve and Profit or Fee are not part of the Performance Measurement Baseline because no work is associated with those budgets. Contrasted with the Performance Baseline, which includes the entire project budget (total cost of the project), the Performance Measurement Baseline is a view from the bottom up where work packages are summed within the Work Breakdown Structure. The Performance Baseline is a top-down view and sees only the Total Project Cost and the Total Estimated Cost and Other Project Cost.

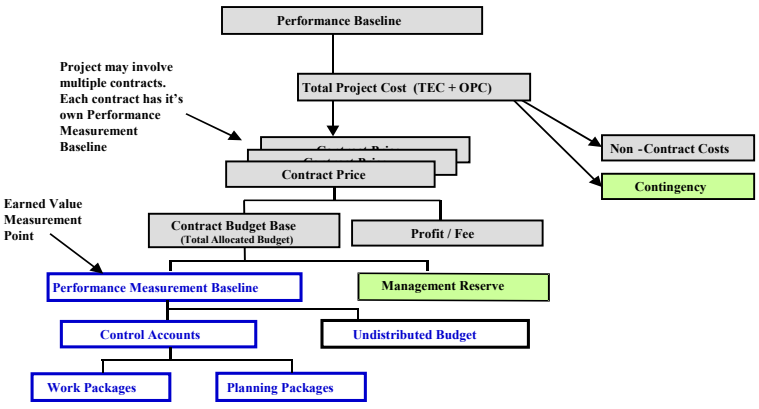


Figure 12-1. Performance Measurement Baseline.

CHAPTER 13. INTEGRATED SAFETY, ENVIRONMENTAL, QUALITY ASSURANCE, AND SAFEGUARDS AND SECURITY

A key component of a successful project is that safety, health, environmental, and quality issues are addressed early in a project's life cycle and fully integrated into all project activities. The responsibility for the safety and health of the public and the workforce, protection of the environment, and quality is a line management responsibility, owned by the entire Integrated Project Team. An Integrated Safety Management System (ISMS) is most effective when developed early and implemented throughout all project phases. ISMS is designed to ensure that safety basis, environmental protection, and worker and public safety is appropriately addressed in the planning and performance of any task. The fundamental premise of Integrated Safety Management (ISM) is that accidents are preventable through early and close attention to the planning, design, and physical execution of a project. Early stakeholder involvement in the planning and execution of a project, utilizing appropriately revised and approved standards is the norm. During the Initiation and Definition phases, the project has the unique opportunity to eliminate or minimize hazards and incorporate cost-effective accident prevention and mitigating features. This includes taking a fresh look at the reference design to provide safety through design. Implementation of safety, health, environmental protection, and quality is to be fully integrated based on principles, acquisition and project plans, and procedures. Throughout this Manual, the term safety encompasses protection of the public, the workers, and the environment. Quality, safety, and environmental protection are to be integrated from the beginning into all projects

13.1 SAFETY

A primary and continuous responsibility of project management is safety. This includes project plans and safety of project personnel, including those who will operate or maintain the facility, or who could otherwise be affected by the decisions made during the project planning, design, construction, and testing stages. This responsibility begins at the time a project or remedial action is planned and continues until the project or remedial action is completed. As the Project Director develops and maintains project baselines, the focus is on providing a safe, quality design.

DOE Policy 450.4 requires that safety management systems be used to systematically integrate safety into management and work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment. Integrated Safety Management (ISM) is required as part of DOE management of projects. As stated in DOE Policy 450.4, *Safety Management System Policy*,

"This is to be accomplished through effective integration of safety management into all facets of work planning and execution. In other words, the overall management of safety functions and activities becomes an integral part of mission accomplishment."

This policy requires that ISM functions and principles apply to all project and remedial action activities through all phases of these efforts. Ensuring adequate protection of the public, the workers, and the environment is an essential activity of the Integrated Project Team, including project planning, design, technology development, construction, testing and turnover, and facility disposition. Each of these key areas is discussed in later subsections.

Project management, in using ISM, ensures that work processes related to planning and engineering are executed with attention to safety; and that work processes related to research, development, testing, use of hazardous materials, and construction techniques are executed with proper controls. This section describes how ISM functions and principles are to be applied to the execution of a DOE project during each stage.

DOE is committed to conducting all work on its projects so that missions can be accomplished with adequate controls in place to protect the public, the workers, and the environment. For those facilities that contain, or will contain, hazardous materials, continuous development and integration of safety analysis, as an integral part of design, is required. In other words, the fulfillment of safety functions by systems and structures becomes an integral part of fulfillment of project and mission functions.

The ISMS, along with the basic assumptions regarding quality and the specific requirements for the project, provides a framework under which the Project Execution Plan and lower-tier documents such as implementation plans and procedures are developed. If the project is covered by an existing DOE site ISMS, then that governing site ISMS should be implemented within the project. If an existing ISMS can be used or modified to accommodate the project, then it is recommended that the project implement the site program through the Project Execution Plan. If the project includes multiple companies, additional ISMS documentation may have to be developed to demonstrate organizational compliance with the specific project ISMS requirements.

13.1.1 Integrated Safety Management System

An ISMS is designed to ensure that environmental, worker, and public safety is appropriately addressed in the performance of any task. A fundamental premise of ISM is that accidents are preventable through early and close attention to safety, design, and operation, and with substantial stakeholder involvement in teams that plan and execute the project, based on appropriate standards. The ISMS consists of the objective, guiding principles, core functions, mechanisms of implementation, clear responsibilities for implementation, and implementation. As such, an ISMS is characterized by a management system's ability to implement the seven guiding principles and five core management functions using the key implementing factors as described below.

To implement ISMS, the project needs to have a commitment to a standards-based safety program. Articulation of these objectives and principles is important, but not sufficient to achieve effective safety management. The challenge to establishing a standards-based safety approach in a project is to provide the rigor associated with the standards, yet provide the flexibility to apply a hazards-based tailored approach to defining the requirements. ISMS, as an

integral part of project management, ensures that work processes related to design, testing, and construction are planned and executed with proper controls and appropriate attention to safety.

The successful safety system functions effectively within safety mandates, considering budget and resource limitations. It enables tailoring so that hazards are identified and controlled, yet do not burden project phases with inflexible, prescriptive controls that needlessly inflate costs and constrain the project, and do not enhance safety. Thus, tailoring within project management functions (planning, analyzing hazards, establishing controls, performing tasks, assessing implementation, and providing feedback) will enable tasks to be managed at the appropriate levels. In effect, management systems function to optimize task planning and performance to enable those closest to the task—those who perform the task, those who manage or supervise the task, and those who will be affected by the results of the task—plan and assume responsibility for it.

To ensure that planning and implementation provides a capital asset that facilitates safe operation and will not have open safety issues at project closeout, safety and environmental issues need to be identified and addressed early. Proper ISMS implementation ensures that the planning, design, and physical work are performed with proper attention to potential hazards, regardless of the type of activity being performed.

13.1.2 Integrated Safety Management Through Design

Addressing safety issues early ensures that plans and designs for safety are integrated into the project. The goal is to ensure that safety is “designed in” early instead of “added on” later with increased cost and decreased effectiveness. Safety through design is not just meeting the specified safety requirements in the design; it is the project team taking specific proactive measures regarding safety. This includes making design changes to eliminate hazards, minimize hazards, mitigate consequences, and preclude events that could release the hazard. Addressing hazards with a safety-through-design approach does not always require that systems, structures, or components be added that will prevent or mitigate the releases. Rather, it may involve removing or moving systems or changing design approaches that result in a safer facility and improved operations. It may also result in fewer safety class and safety significant controls being required in the final design.

For nuclear facilities, the recognition of anticipated hazards in the facility design requires special considerations. DOE has established the Safety Analysis Report as the preferred method for authorizing operation for its most hazardous facilities. The Safety Analysis Report also provides a critical feedback mechanism for the project. To ensure integration of safety and design, the documents that support Safety Analysis Report preparation (e.g., Hazards Analysis Document, Fire Hazards Analysis, Emergency Response evaluations, etc.) need to be initiated early and developed along with the design. ISM provides the framework to provide continuous coordination between these two activities as necessary throughout the design process to ensure the final design meets both mission and safety requirements.

Objective

The project objective is to systematically integrate safety into management, planning, and work practices at all levels and at all stages of the project so that missions are accomplished while ensuring protection for the public, the worker, and the environment. This is accomplished through effective integration of safety management into all facets of project planning and execution, such that the overall management of safety functions and activities become an integral part of the project. The ISMS description needs to address the project roles and responsibilities for changing project teams and contracts during each project phase. Due to the changing need in each area, the Project Director needs to ensure that appropriate coverage is provided on the Integrated Project Team from these organizations on the Integrated Project Team for each phase of the project.

Guiding Principles

The ISM Guiding Principles and Core Functions, provided in DOE Policy 450.4, *Safety Management System Policy*, are required to be applied to ensure that safety is integrated into all phases of project planning and implementation. These principles, as they relate specifically to project management, are:

- *Line Management Responsibility for Safety*: Project management is directly responsible for ensuring the facility structures, systems, and components, or the remedial activities recovery actions, protect the public, the workers, and the environment.

- *Clear Roles and Responsibilities*: Clear and unambiguous lines of authority and responsibility for ensuring safety is integrated into designs and remedial actions and are established and maintained at all organizational levels within the Department, the project, contractors, and suppliers.

- *Competence Commensurate with Responsibilities*: Project personnel need to possess the experience, knowledge (including project procedures and controls), skills, and abilities necessary to complete their responsibilities. Capital assets, including those that contain or will contain hazardous material, require specific competencies including hazard analysis, accident analysis, safety system design, Quality Assurance, facility construction, and facility operation and maintenance, which are tailored based on risk.

- *Balanced Priorities*: Programmatic, operational, and safety requirements need to be effectively fulfilled by facility features. Protecting the public, the workers, and the environment is a priority for all design, construction, modification, or remediation.

- *Identification of Safety Standards and Requirements*: The Project Director should ensure the hazard evaluation process is initiated early and continued throughout the project. Before detailed design is performed, the associated hazards must be evaluated and an agreed-upon set of safety standards and requirements established, which if properly implemented will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences of facility operation.

- *Engineered Controls Tailored to the Function Being Designed or Performed*: Engineering controls that are designed to prevent and mitigate hazards are tailored to the facility function or the remedial activity and the associated hazards.

- *Approval to Proceed*: Reviews (project, design, and independent) are conducted to verify that safety has been adequately integrated into the evolving design before approval is given to proceed to the next design phase, procurement, construction, or operation.

Core Functions

The expectations for an ISM approach can be described by a successive set of actions or activities. This management system is modeled by the five core safety management functions, shown in Table 13-1 to reflect the design process.

Table 13-1. ISMS Operations to Projects Relationships

ISMS Operations	ISMS Projects
Define the Work	Requirements and Technical Scope of Work
Analyze the Hazards	Analyze Potential Hazards
Develop and Implement	Develop Design Controls/Hazard Controls Requirements
Perform Work within Controls	Perform Work/Design
Assessment and Feedback	Review, Feedback, Improvement and Validation

The five core safety function relationships are illustrated in Figure 13-1. Although the arrows indicate a general direction, these are not independent, sequential functions.

Requirements and Technical Scope of Work. During each design stage, safety and design planning/documentation are progressively developed, become more detailed, and are placed under change control. The design/plan from a previous stage becomes the baseline for the next stage.

Analyze Potential Hazards. Hazards and accidents are analyzed in progressively more detail in each stage. Safety analysts work closely with project engineers to develop a common understanding of the facility, systems, and processes, possible hazards including hazardous materials, and the envisioned operation of the facility.

Develop Controls/Requirements. Hazard controls are translated into safety functions and progressively more detailed requirements affecting the project. Hazard analysis and accident analysis (if needed) will identify aspects of process and design necessary for safety, as well as systems that are dedicated to the fulfillment of necessary safety functions. In addition to physical

controls, administrative controls required to provide or support the safety functions are identified.

External constraints, such as laws, rules, codes, standards, and contracts are examined for their applicability. Relevant criteria and requirements are extracted and entered into the project-specific design Manuals.

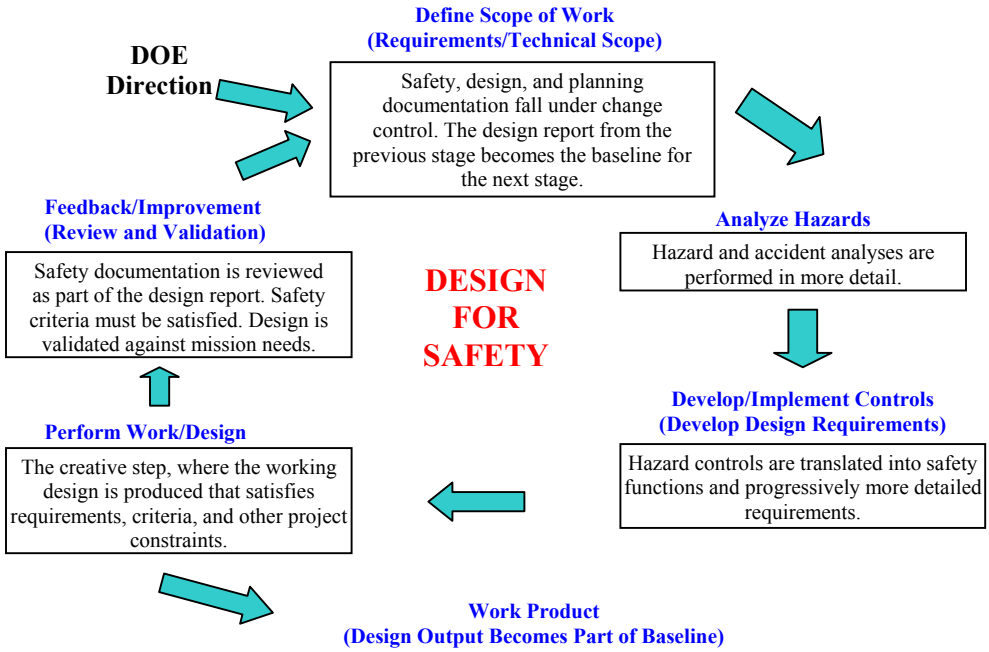


Figure 13-1. Safety Aspects in a Typical Design Stage

Perform Work/Design/Plan. While not always visible as a discrete function in the process, design, and planning, is the "creative" function of the process, where a working design/plan that will satisfy requirements, criteria, and other constraints is developed. The working designs/plans are committed to "paper" and assembled into a package that constitutes the output of this stage, and is approved under configuration (change) control.

Review, Feedback, Improvement and Validation. This function consists of unscheduled (lower-tiered) reviews and (upper-tiered) scheduled Critical Decision reviews. Safety design is specifically included in the review, and safety review criteria are established for each stage. The review criteria for earlier stages are reexamined in each stage to ensure corrective actions from prior reviews have been taken and those changes have not invalidated earlier reviews. The process of developing the safety documentation (e.g., Safety Analysis Report) provides a valuable feedback and improvement mechanism for this function.

13.1.3 Integrated Safety Management System Implementation for Project Management Activities

As previously described, ISM is an essential part of all project activities. The guiding principles and core functions of ISM should be used throughout each project. This section discusses applying ISM to key project activities: planning, design, technology development, construction, and facility disposition. To ensure project execution planning appropriately addresses the interactions between the seven principles and five core functions, a crosswalk of guiding principles and core functions against implementation within the procedures and practices is helpful. This crosswalk provides a valuable tool for the Project Director and Integrated Project Team to ensure the implementation procedures address ISM functions and principles. A continuing focus of ISMS implementation is to ensure that the stakeholders are fully and appropriately involved with the current phase of the project as well as detailed planning for the next phase.

Project Planning

Project planning should include early identification of potential hazards. For nuclear facilities, activities recommended in DOE Guide 420.1-1, Section 2, will be conducted at the appropriate stages of the design. The Project Execution Plan should address ISM implementation within the project. A proven principle of project planning is that the project be routinely evaluated to ensure that all areas are fully integrated and that changes in one area are reflected in other areas. A valuable safety communications tool for projects with hazardous facilities (those categorized above Hazard Category-2) is the lower-tier safety analysis and documentation plan. The plan may be used to communicate the level of safety documentation that will be available at each critical decision point in the project. Early agreement by both the project and regulating body on the level of safety documentation by phase supports project planning but minimizes regulatory issues later in the project. The practices provide an example of one of these plans and the level of documentation required for a relatively complex facility. For small, less complicated work scopes, safety planning may be effectively covered in the Project Execution Plan.

Integrating Safety with Design

Delivering a facility or a modification that can meet its mission requirements while maintaining the safety of the public, the workers, and the environment is essential for a successful project. For those facilities that contain or will contain hazardous materials, continuous development and integration of the safety analysis as an integral part of design is required. This is accomplished using ISM within design as described in Section 3.1.2. The task of developing the safety basis for the facility often drives design and operational requirements. The early integration of safety and design permits the development of timely and cost-effective solutions from the start, rather than as a crisis backfit at the end of the project. Providing a design that only meets all of the specified safety requirements may not be adequate to implement a safety-through-design approach.

Project Authorization

During the project phase, there are clear, top-tier project hold points based on risk or hazards, for which an authorization to proceed is required. These top-tier project hold points are identified on the project's integrated schedule. Safety and environmental documentation support each of these authorization points. The authorization basis for the design phase for facilities with a DOE-STD-1027 categorization of Hazard Category-3 or higher will include a Preliminary Documented Safety Analysis/Preliminary Safety Analysis Report, the Safety Evaluation Report, and the feedback from independent design reviews. Authorization for facilities below Hazard Category-3 is based on a like document (e.g., Auditable Safety Analysis), which may be covered as part of a Health and Safety Plan. The results from these elements should be used to develop the basis for authorizing and completing design work. During the Execution Phase, adherence to the approved Preliminary Documented Safety Analysis or Safety Analysis Report (or like documents) and enforcement of those requirements are key elements for authorizing construction work. Finally, the authorization basis for the start-up activities should be completing the Safety Analysis Report/Documented Safety Analysis/ Safety Evaluation Report required to satisfy issuance of an approved Documented Safety Analysis/Final Safety Analysis Report. Each of these authorizing documents, and the ISM description, need to be updated periodically (typically, at least annually) as a result of technical changes, budget changes, feedback from reviews, and execution/closeout issues. In addition, the documents reflect the development of the Documented Safety Analysis/Final Safety Analysis Report which only occurs in the later phases of new facility development. Hold points should be implemented at a lower "task" level to ensure that proper attention has been placed on each of the potentially affected areas prior to the project critical decision points.

13.1.4 Safety Documentation and Project Support

Timely development of safety documentation is critical to project implementation. As presented in Chapter 2, Figure 2-2 depicts the major stages of the project and the documentation needed to support each stage.

A key project element is the alignment of the requirements, the documentation, the facility, and the work practices associated with the facility throughout all project phases.

Critical roles for safety, following the design phase, include construction or remediation safety, testing and turnover activities, and ultimately, safety for the operations phase, which is not covered in this Manual.

Safety in Technology Development and Demonstration Activities

Any activities associated with tests, experiments, proof-of-principle or technology development related to a project will also be carried out using the guiding principles and core functions of ISM according to DOE Policy 450.4. These activities are to be adequately planned, have hazards analyzed and controls implemented, be performed within controls, and have a review and feedback function.

Construction/Remediation Safety

Construction/remediation safety is best implemented using the five core functions and the seven guiding principles of DOE Policy 450.4 and its implementing guide. To ensure cost-effective implementation, plans need to be developed early as part of project planning and documentation. Hazards are to be analyzed and appropriate controls established to protect workers during the construction phase. These controls should be those specified by the Occupational Health and Safety Administration, plus any others needed to ensure safety. Safety programs ensure that construction activities are performed within controls. Finally, review mechanisms verify appropriate implementation of the construction safety program, and that the final project meets all requirements.

Preparation and use of installation/assembly procedures is an example of a valuable control. These procedures typically identify the methods of construction, special tooling/rigging, hold points, and acceptance criteria. This planning/documentation ensures the task is thoroughly evaluated prior to proceeding. Involvement of all affected functions in the preparation of these procedures minimizes potential issues during construction.

Projects involving facility disposition activities should also use the guidance in DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*.

Testing, Commissioning, and Turnover Safety

Testing, commissioning, and turnover safety is best implemented using the five core functions and the seven guiding principles of DOE Policy 450.4 and its implementing guide. During this phase, hazards are to be identified and evaluated, and proper controls established. Of particular importance are hazards associated with stored energy (pressure, temperature), electrical, fluid flow, and operating equipment. Of critical importance is controlling ownership of the facility (or portions thereof) during this phase. Knowing which portions of the facility have been turned over to operations and which portions have not is critical to maintaining safety during turnover. If a phased turnover is planned, special attention needs to be given to those structures, systems, and components that are in operation, and the interfaces with non-impacting structures, systems, and components.

13.2 ENVIRONMENT

The principle for environmental integration is that Project Directors are committed to being stewards of the environment and execute projects in an environmentally sound and responsible manner. The scope of projects often involves handling, treating, storing, transporting, or disposing of hazardous, toxic, or radioactive material or waste. DOE is committed to complying with applicable environmental laws and regulations and responsible for preserving and improving the quality of the environment. The Department demonstrates this commitment by integrating environmental safety, including pollution prevention, waste minimization, and resource conservation activities, into all projects. The Department also applies a tailored approach to environmental management to ensure a cost-effective, value-added approach to complying with environmental requirements and concerns. A key principle is that projects

conduct all activities in a manner appropriate to the nature, scale, and environmental impacts of these activities, while maintaining compliance with applicable Federal and State legislation and regulations. Specific implementation practices and requirements are described in Section 3.2.2.

13.2.1 Background

International Standards Organization 14001 principles have been effectively used by DOE sites and projects to implement an environmental management system as required by Executive Order 13148. ISO 14001 defines a framework for the system associated with most projects. The system is composed of the elements of an organization's overall management structure that address the immediate and long-term impact on the environment of its products, services, and processes.

13.2.2 Environmental Protection and Compliance

Each project is to be implemented under a written environmental management process to anticipate and meet growing environmental performance expectations, and to ensure ongoing compliance with regulatory requirements. This management process may either be facility/project specific or a site-wide management system. Environmental management processes are discussed in Executive Order 13148, *Greening the Government Through Leadership in Environmental Management* and DOE Guide 450.4-1A, *Integrated Safety Management System Guide*. The environmental baseline for a project is to be established prior to any work being performed at the worksite. For remediation projects, the environmental baseline is typically provided as an integral part of the baseline risk assessment. Environmental baseline monitoring may be required considerably before beginning construction.

Implementation of an environmental management system may be through compliance with, and certification to ISO 14001, *Environmental Management Systems—Specification with Guidance for Use*. In general, a project's environmental management system should achieve the principles noted below.

- Assess potential environmental impacts.
- Assess legal and regulatory requirements.
- Establish an appropriate life-cycle environmental policy, including a commitment to prevention of pollution.
- Determine the legislative requirements and environmental aspects associated with project activities, products, and services.
- Develop management and employee commitment to the protection of the environment with clear assignment of accountability and responsibility.
- Encourage environmental planning throughout the project's life cycle for all project activities from planning through closeout.
- Establish a disciplined management process for achieving targeted performance levels.

- Provide appropriate and sufficient resources, including training, to achieve targeted performance levels on an ongoing basis.
- Establish and maintain an emergency preparedness and response program.
- Continuously evaluate environmental performance against policy, appropriate objectives and targets, and seek improvement where appropriate.
- Establish and maintain appropriate communications with the customer as well as internal and external stakeholders.
- Encourage and, as appropriate, require contractors and suppliers to establish an environmental management system or other type of written environmental management process.

Environmental considerations are part of most projects regardless of the project type (e.g., design, construction, environmental cleanup, or facility startup). The Integrated Project Team needs to understand the regulatory framework for the various environmental regulations—particularly those associated with environmental cleanup. Support to the Integrated Project Team would normally include support from an environmental specialist. The typical steps each project needs to complete to ensure it meets its environmental stewardship commitment are outlined in Figure 13-2.

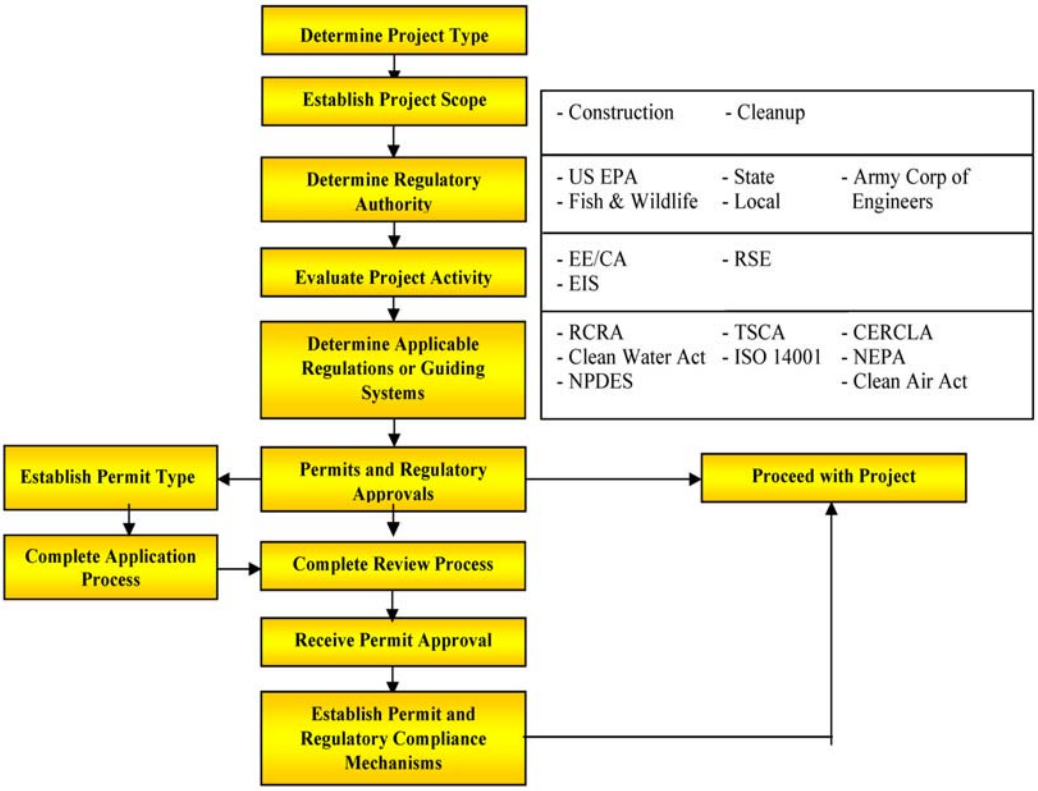


Figure 13-2. Typical Environmental Activities for DOE.

An example of one of the environmental regulations that may be applicable to the project is the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). CERCLA is guided by the National Oil and Hazardous Substance Pollution Contingency Plan, commonly referred to as the National Contingency Plan. This plan outlines the steps that will be followed in responding to situations in which hazardous substances, pollutants/contaminants, or oil are inadvertently released into the environment. The National Contingency Plan establishes the criteria, methods, and procedures that the U.S. Environmental Protection Agency and other Federal agencies (including DOE) are required to use to determine priority releases for long-term evaluations and response.

The National Contingency Plan does not specify project cleanup levels or how cleanup will be conducted. The National Contingency Plan relies on other regulations, (e.g., *Resource Conservation and Recovery Act*, *Clean Water Act*, and *Clean Air Act*) to provide clean-up levels and the framework for managing a CERCLA project site. Figure 13-3 outlines the CERCLA regulatory hierarchy. DOE projects may have additional environmental regulations that must be met. The *National Environmental Policy Act* process is an example of one such regulation. This process is a decision-making and planning tool for any DOE project that could have an environmental impact, not just environmental cleanup projects.

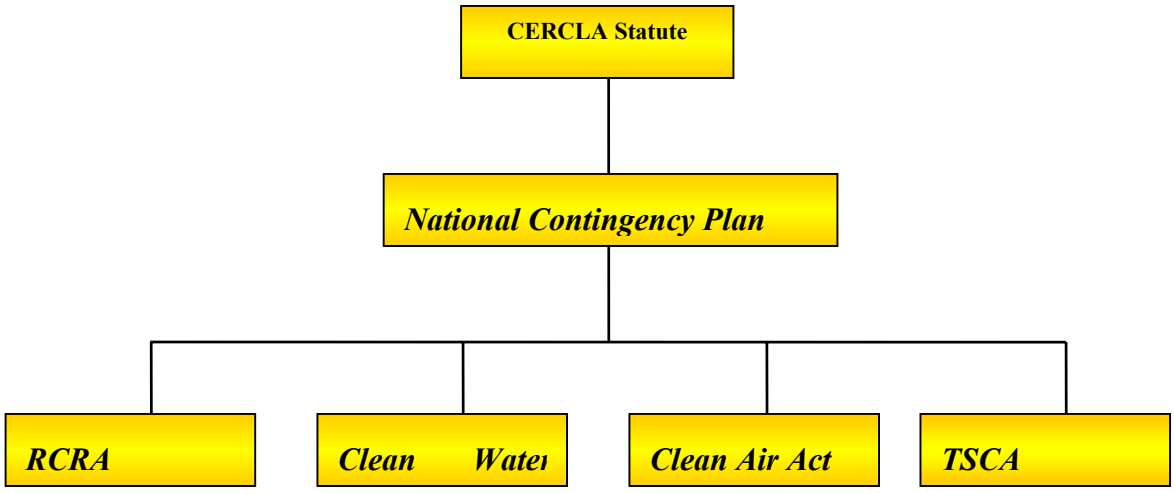


Figure 13-3. CERCLA Regulatory Hierarchy.

13.3 QUALITY ASSURANCE

The Project Director is responsible for planning and implementing a Quality Assurance Program for the project and ensuring that quality is integrated with the project along with safety, health, and environmental protection. The line organizations are responsible for ensuring the quality of the project. Quality Assurance begins at project conception and runs through design, development, construction, fabrication, operation, remediation, and decontamination and decommissioning. Quality affects cost, availability, effectiveness, safety, and impact on the environment. Therefore, appropriate aspects of Quality Assurance need to be given careful consideration during the preparation of project documentation. This is accomplished when there

is a recognized need to obtain the level of product and performance quality necessary to accomplish program objectives; provide reliability and continuity of operations commensurate with DOE responsibility for health and safety; and for the protection of personnel, the environment, and property.

- The Project Director is responsible for defining and ensuring that effective implementation of required Quality Assurance activities be established and implemented by the contractor.

- Line management is responsible for ensuring compliance with quality implementing procedures and practices.

Quality Assurance is mandated through the promulgation of a DOE Order (414.1A) and a Rule (Title 10 Code of Federal Regulations [CFR] 830.120). The Order applies to all projects and facilities, and requires that both DOE and its contractors prepare and comply with an approved Quality Assurance Program. Title 10 CFR 830.120 (the Rule) identifies the top-level quality assurance requirements for establishing quality assurance programs for DOE management, operating contractors, and organizations performing work at or for DOE nuclear facilities.

The Order and Rule provide the basic areas to be covered by the project Quality Assurance Program. For nuclear projects, 10 CFR 830.120 and its attendant Price Anderson Act Program is to be implemented. For other programs, DOE Order 414.1A is to be applied.

10 CFR 830.120 and DOE O 414.1A have the same 10 basic requirements, subdivided into three sections. Successful implementation of these criteria can be summarized as follows.

A. MANAGEMENT

Criterion 1 – Program

- A written Quality Assurance Program has been developed, implemented, and maintained.

Criterion 2 – Personnel Training and Qualification

- Personnel have been trained and qualified for the task assigned and training is continuing.

Criterion 3 – Quality Improvement

- Processes are in place to detect and prevent quality problems, control nonconforming items, identify cause and correction of quality issues, and provide for improvement.

Criterion 4 – Documents and Records

- Documents are prepared, reviewed, approved, and issued to specify requirements or establish designs. Records are specified, prepared, reviewed, approved, and maintained.

B. PERFORMANCE

Criterion 5 – Work Processes

- Work is performed to established standards and controls.
- Items are identified and controlled for proper use.
- Items are maintained.
- Instruments are calibrated and maintained.

Criterion 6 – Design

- Sound engineering standards and principles are being used in the design.
- Designs incorporate appropriate requirements and bases.
- Design interfaces are identified and controlled.
- Design adequacy has been or will be verified or validated by an independent group before the design is implemented.

Criterion 7 – Procurement

- Procured items and services meet established requirements.
- Suppliers are evaluated against specified criteria.
- Suppliers are routinely evaluated to ensure continuing acceptability.

Criterion 8 – Inspection and Acceptance

- Inspection and testing are using equipment that has been calibrated and maintained to ensure acceptance and performance criteria are met.

C. ASSESSMENT

Criterion 9 – Management Assessment

- Managers routinely assess their processes.
- Problems that hinder achievement of objectives are identified and corrected.

Criterion 10 – Independent Assessment

- Independent assessments are planned and conducted to measure item and service quality, measure adequacy of work performed, and promote improvement.

- Independent assessments are performed by groups independent of the performers to ensure the effective performance of responsibilities.

- Assessors are technically qualified and knowledgeable in the assessed areas.

13.3.1 Quality Assurance Program

The Quality Assurance Program describes the overall quality management system and the project responsibility and authority for quality-related activities. The Quality Assurance Program covers the functional activities involved in the production of end items, products, and services.

Senior management demonstrates commitment and leadership to achieve quality through active involvement in the development and implementation of the Quality Assurance Program. Line management is responsible for ensuring that line personnel are indoctrinated and trained to the requirements of the Quality Assurance Program Manual and the respective project procedures that implement quality requirements. Project personnel are responsible for achieving quality in the performance of their work activities.

The Quality Assurance Program identifies line management ownership of quality and provides for line management responsibility and involvement at all levels. It further recognizes the need to continuously assess and improve internal processes.

13.3.2 Quality Assurance Program Requirements

The Integrated Project Team prepares a Quality Assurance Program at the earliest possible stage. The Quality Assurance Program should address all applicable elements of either the Rule or the Order. Guidance is provided in DOE G 414.1-2 as to what should be considered in preparing the Quality Assurance Program to meet the Order and is also appropriate guidance for the Rule. The Quality Assurance Program is a living document, subject to review and revision as the project grows and matures. For example, when a project selects a contractor for design, the Quality Assurance Program will require revision to address the methods to be used to ensure the design agency is incorporating quality and quality requirements in design activities and deliverables.

The Integrated Project Team should tailor the selected standards to the requirements of the project to ensure an adequate level of control is applied to all project activities. This means that the project activities to be performed should be addressed, explaining the methods used to ensure each activity is appropriately controlled.

The key requirements to be considered when developing the Project Quality Assurance Program area are included in the references identified in Appendix B.

13.3.3 Program Development

Projects select an appropriate industry standard and tailor that standard to meet applicable Rule and Order requirements as well as the project requirements. For example, a nuclear facility construction project may select the American Society of Mechanical Engineers/National Quality

Assurance Standard-1 as an appropriate industry standard upon which to base the Quality Assurance Program and develop a cross-referenced matrix between the prepared National Quality Assurance Standard-1 Program and the requirements of 10 CFR 830.120. Regardless of the standard selected, a matrix of applicable project procedures to meet the selected industry standard and the Rule and Order requirements ensures that all appropriate control aspects are in place. An important feature of the program is to carefully separate the project's nuclear aspects from the nonnuclear features due to *Price Anderson Amendment Act* considerations. Tailoring of Quality Assurance requirements is discussed later in this section.

The Quality Assurance Program matrix is composed of implementing procedures from all aspects of the project. This means that implementing procedures such as procurement, engineering, test, safety, environmental, assessment, quality assurance, and others are identified in the matrix that makes up the project's Quality Assurance Program.

The Quality Assurance organization supports the project at all levels, aiding in developing systems and procedures necessary to ensure compliance with the applicable project requirements. The Quality Assurance organization also provides an independent level of assurance, through audits, surveillance, and reviews, that the project, customer, and regulatory requirements are being met. As a member of the project, Quality Assurance supports the project effort to complete the project on time, within budget, and within requirements.

13.3.4 Implementation

Quality Assurance Program implementation occurs in phases. As early as possible (and no later than the beginning of conceptual design), the quality standard to be applied will have been selected and the Quality Assurance Program prepared. The Quality Assurance Program includes the quality program matrix identifying how applicable DOE standards will be met. The Quality Assurance Program and matrix identifies all of the controls required and provides details for implementing control features, including identification of those controls needing to be in place early. The remaining systems and procedures will be planned and scheduled for implementation prior to need. This means that procedures for the control of procurement activities, design, and construction will be developed and issued before those activities commence.

A critical step in the development of all these formal processes is the determination of how the quality requirements will be applied. Cost is a consideration as well as meeting quality expectations. For example, as soon as the radiologically significant components of the facility are identified, Quality Assurance Program planning should commence to ensure that the appropriate quality controls are applied during design, procurement, fabrication, and testing. An essential component of tailoring quality requirements is categorizing facility systems and components. Early in the pre-acquisition stage, the project team should develop a method to categorize project systems, components, and activities based on such things as radiological, environmental, cost, and schedule impact. Existing site categorization systems should be considered and used where possible prior to creating new systems.

13.4 SOURCE DOCUMENTS

DOE Orders provide requirements for specific activities, such as packaging and transportation (DOE Orders 460.1A and 460.2), worker protection (DOE Order 440.1A), etc. The specific set of applicable laws and DOE Orders, Standards, Policies, Manuals, and Guides appropriate for implementing safety, health, environmental, and quality requirements are to be defined for each project. DOE Guides and DOE Standards support implementation of the Orders. The key source documents to be considered when developing and implementing the safety, environmental, and quality portion of the project management activities are listed in Appendix B, References. Some of these source documents provide hazard, task, or facility specific requirements.

13.5 SAFEGUARDS AND SECURITY

Safeguards and Security is also an integral part of project planning and execution. Safeguards and Security refers to the parameters of physical security that are built into a facility concerning access control, intrusion alarms, construction of vaults, property protection features, Operational Security, and even architectural surety. Safeguards and Security requirements, when applicable, should be addressed early in the initial phase of a project and along with safety, quality, and environmental protection, integrated throughout all project phases. The Integrated Project Team should include Safeguards and Security representation, if appropriate, and Safeguards and Security should be confirmed and integrated by the Project Director. Life-cycle cost analysis and overall system engineering should identify the requirements and costs for Safeguards and Security during early project planning.

Safeguards and Security should be considered and incorporated into all phases of a project, examples include:

- Preconceptual planning, draft a preliminary vulnerability assessment and initiate Operational Security considerations.
- Conceptual design should include a more detailed conceptual vulnerability assessment.
- Safeguards and Securitystandards and requirements are incorporated into the design criteria, specifications and drawings.
- Construction and testing should address and confirm Safeguards and Securitydesign requirements.

Plans and considerations related to Safeguards and Security should be included as part of the Project Execution Plan and may affect other components of the Project Execution Plan, such as emergency preparedness planning, communications, and procurement planning.

CHAPTER 14. RISK MANAGEMENT

14.1 INTRODUCTION

Risk has always been a concern in the acquisition of DOE capital assets. The acquisition process is designed, to a large degree, to allow risks to be controlled from conception to delivery. Often managers view risk as something to be avoided, yet the Department's projects are often complex, technically challenging, and costly, all of which translates to risk. Risk is inherent in all projects regardless of the complexity and other factors. Consequently, the objective is not to avoid risks but to understand them and control them. The DOE approach to managing risk is integrated, forward-looking, disciplined, and continuous.

Risk management is concerned with future events, whose exact outcome is unknown, and how to deal with these uncertainties by identifying and examining a range of possible outcomes. In general, outcomes are categorized as favorable or unfavorable, and risk management is the art and science of planning, assessing, and handling future events to ensure favorable outcomes. The alternative to risk management is crisis management, a resource-intensive process that is normally constrained by a restricted set of available options.

Risk is a measure of the potential inability to achieve overall project objectives within defined scope, cost, schedule, and technical constraints. The two components of risk include the *likelihood* of failing to achieve a particular outcome, and the *consequences* of failing to achieve that outcome.

Risk events are elements of an acquisition effort that are assessed to determine the level of risk, such as things that could go wrong for a project or system. The events should be defined to a level that an individual comprehends any potential impacts and causes. For example, a potential risk event for a remediation project could be the discovery of high-level waste in an area not thought to contain high-level waste. There are series of events that contain risk. These events can be selected, examined, and assessed by subject matter experts.

The relationship between the two components of risk probability and consequence or impact is complex. To avoid obscuring the results of an assessment, the risk associated with an event should be characterized in terms of its two components: probability and consequences. As part of the assessment, there is a need for documentation containing the supporting data and assessments.

The key to successful risk management is early planning, unbiased assessments, and aggressive execution. Good planning enables an organized, comprehensive, and iterative approach for identifying and assessing the risk and handling options necessary to successfully carry out the acquisition of a capital asset. To support these efforts, the six-step risk process (Figure 14-1) should be performed as early as possible in the life cycle to ensure that critical technical, scope, schedule, and cost risks are identified and/or addressed as part of the program and project planning, execution, and budget activities.

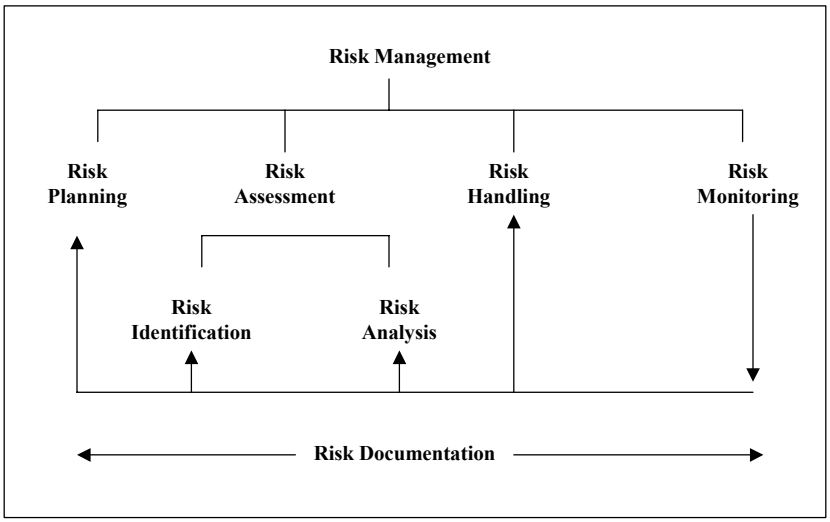


Figure 14-1. Risk Management Functional Flow Diagram.

Managers should continuously update acquisition and risk assessments and modify their management strategies accordingly. Early information provides data that facilitates decision making and management. As a project progresses, new information improves insight into risk areas, thereby allowing the development of effective handling strategies. The net result promotes executable projects.

14.2 CHARACTERISTICS OF EFFECTIVE RISK MANAGEMENT

Effective risk management requires involvement of the entire Integrated Project Team, and may also require support from external experts knowledgeable in essential risk areas (e.g., technology, design, safety, quality, manufacturing, logistics, schedule, and cost). External experts may include representatives from users, laboratories, contractors, program offices and industry. Users, including all essential participants, are to be part of the assessment process so that an acceptable balance among performance, scope, schedule, cost, and risk can be reached. A close relationship between the Government and industry, and later with the selected contractor(s), promotes an understanding of project risks and assists in developing and executing risk management efforts.

A successful risk management program should have the following characteristics.

- Feasible, stable, and well-understood user requirements
- A close relationship with user, industry, and other appropriate participants
- A planned and structured risk management process, integral to the acquisition process

- An acquisition strategy consistent with risk level and risk handling strategies
- Continual re-assessment of project and associated risks
- A defined set of success criteria for all performance, scope, schedule, and cost elements (e.g., Performance Baseline thresholds)
- Metrics to monitor effectiveness of risk handling strategies
- Effective test, checkout, and startup/turnover plans
- Formal documentation

To ensure that a risk management program possesses the above characteristics, managers should follow the guidelines below.

- Assess project risks using a structured process, and develop strategies to manage risks throughout each acquisition phase.
- Identify early and intensively- managed design parameters that critically affect cost, capability, or readiness
- Use technology demonstrations/modeling/simulation and aggressive prototyping to reduce risks
- Use test and evaluation as a means of quantifying the results of the risk handling process
- Include industry and user participation in risk management
- Use developmental test and evaluation when appropriate
- Establish a series of "risk assessment reviews" to evaluate the effectiveness of risk handling against clearly defined success criteria
- Establish the means and format to communicate risk information and to train participants in risk management
- Prepare an assessment training package for members of the Integrated Project Team and others, as needed
- Acquire approval of accepted risks at the appropriate decision level

In general, management of software risk is the same as management of other types of risk and techniques that apply to hardware projects are equally applicable to software intensive projects.

14.3 RISK MANAGEMENT PROCESS

There are four key functions that comprise the risk management process.

- Planning
- Assessment (includes risk identification and analysis)
- Handling
- Monitoring

A simplified view of these four functions is shown in Figure 14-1.

The overriding objective of the risk management process is to identify potential project risks and implement actions that will mitigate the impact of the identified risks. Early risk and hazards identification and analyses should be "built-in" to the project during conceptual design to establish a foundation for further project development, refinement, and execution.

Although each risk management strategy depends upon the nature of the system being developed, research reveals that good strategies contain the same basic processes and structure shown in Figure 14-1. The application of these processes varies with acquisition phases and the degree of system or project definition; all may be integrated into the overall acquisition management function.

14.3.1 Risk Planning

Risk planning is the process of developing and documenting an organized, comprehensive, and interactive strategy, as well as methods for identifying and tracking risk areas, developing risk handling plans, performing continuous risk assessments to determine how risks have changed, and assigning adequate resources. This process includes:

- Developing and documenting an organized, comprehensive, and interactive risk management strategy
- Determining the methods to be used to execute the strategy.
- Plan for adequate resources

Risk planning is iterative and includes describing and scheduling the activities and process to assess, handle, monitor, and document the risk associated with the program. The result is the Risk Management Plan. Projects with significant complexity, concurrency, and risk should develop a Risk Management Plan. This plan identifies the scope of the project's risk definition and defines interfaces with other entities, projects, facilities, and organizations; delineates the methodology that will be used to identify and quantify or assess risks; assigns personnel and/or organizational responsibilities; and provides risk tracking and closeout mechanisms. For smaller

projects, the Risk Management Plan may be included in the Project Execution Plan. Regardless of its location, the plan is maintained throughout the life of the project.

The Integrated Project Team should periodically review the plan and revise it if necessary. Some events, such as: (1) a change in acquisition strategy, (2) preparation for a major decision point, (3) technical audits and reviews, (4) an update of other plans, and (5) preparation for budget submission may drive the need to update an existing plan. Planning begins by developing and documenting a risk management strategy. Early efforts establish the purpose and objective, assign responsibilities for specific areas, identify additional technical expertise needed, describe the assessment process and areas to consider, delineate procedures for consideration of handling options, define a risk rating scheme, dictate the reporting and documentation needs, and establish report requirements and monitoring metrics. This planning should also address evaluation of the capabilities of potential sources as well as early industry involvement. The project's strategy to manage risk provides the team with direction and basis for planning. Initially formalized during a project's concept development and updated for each subsequent phase, the strategy should be reflected in the project's acquisition strategy, which with requirements, known risks, and system and project characteristics are sources of information for Integrated Project Teams use to devise a risk management strategy and begin developing a Risk Management Plan.

Since the project's risks are affected by the Government and contractor team's ability to develop, acquire or construct the asset, industry can provide valuable insight into this area of consideration. The plan is the road map that tells the Government and contractor team how to get from where the project is today to where the program wants it to be in the future. The key to writing a good plan is to provide the necessary information so the program team knows the objectives, goals, and the Integrated Project Team's risk management process. Since it is a map, it may be specific in some areas, such as the assignment of responsibilities for Government and contractor participants and definitions, and general in other areas to provide a choice of the most efficient way to proceed. For example, a description of techniques that suggests several methods for evaluators to use to assess risk is appropriate, since every technique has advantages and disadvantages depending on the situation.

Risk identification is initiated through risk screening. Screening is performed against an established set of trigger questions, identifies significant potential risks associated with a project, and focuses on the ability to design and execute the proposed project and to operate the resultant facility or property. The process identifies "potential" project risks (e.g., cost, scope, schedule, and technology), by two methods. The first is the top-down approach, which identifies programmatic risks such as funding, political considerations, and other risks that are not a function of the project. The second method is the bottoms-up approach where the Integrated Project Team identifies the risks at the lowest reasonable level of the Work Breakdown Structure and screens each element up to the top level of the structure.

This two-step horizontal and vertical approach ensures that the risk identification process captures the complete universe of risk events. When defining risks, the level of detail must be commensurate with the stage of the project. For example, during concept development, new technology is being considered. In describing this risk, it can have applicability not only to the technology area but also to the potential resources, design complexities, testing, and interfaces

among systems and components within the project scope and with external entities or procurements. Noncomplex projects, such as buildings which are intended for human habitation, tend to have almost no significant risks. For these projects, the risk management process may be abbreviated and risks managed at a higher level than for more complex and costly projects.

14.4 RISK IDENTIFICATION, ASSESSMENT AND MITIGATION

Implicit in the definition of risk is the concept that risks are future events, i.e., potential problems, and that there is uncertainty associated with the project if these risk events occur. Therefore, there is a need to determine, the probability of a risk event occurring and to estimate the consequence/impact if it occurs. The combination of these two factors determines the level of risk. For example, an event with a low probability of occurring, yet with severe consequences/impacts, may be a candidate for handling. Conversely, an event with a high probability of occurring, but with consequences/impacts that do not directly affect a project may be acceptable and require no handling.

To reduce uncertainty and apply the definition of risk to acquisition programs, managers should be familiar with the types of acquisition and project risks, understand risk terminology, and know how to measure risk. These topics are addressed in the next several sections.

14.4.1 Characteristics of Acquisition Risk

Acquisition projects tend to have numerous, often interrelated, risks; they are not always obvious; relationships may be obscure; and they may exist at all project levels throughout the life of a project. Risks are everywhere in the early planning in support provided by other Government agencies in mission need risk assessment and in prime contractor processes, engineering and manufacturing processes, and technology. The interrelationship among risk events may cause an increase in one because of the occurrence of another. For example, a slip in schedule for an early test event may adversely impact subsequent tests, assuming a fixed period of test time is available.

Another important risk characteristic is the time period before a future risk event occurs, because time is critical in determining risk-handling options. If an event is imminent, the Project Director may have to resort to crisis management. An event that is far enough in the future to allow management actions may be controllable. The goal is to avoid the need to revert to crisis management and problem solving by managing risk up front.

An event's probability of occurrence and consequences/impacts may change as the development process proceeds and information becomes available. Therefore, throughout the development phase, project directors should re-evaluate known risks on a periodic basis and examine the project for new risks.

14.4.2 Risk Areas and Risk Events

Acquisition risk includes all risk events and their interrelationships. It is a top-level assessment of impact to the project when all risk events at the lower levels of the project are considered. Acquisition risk may be a roll-up of all low-level events; however, most likely, it is a subjective

evaluation of the known risks by the Integrated Project Team, based on the judgment and experience of experts. Any roll-up of project risks should be carefully done to prevent key risk issues from "slipping through the cracks." Identifying risk is essential because it forces the Integrated Project Team to consider relationships among all risks and may identify potential areas of concern that would have otherwise been overlooked. The greatest strengths of a formal, continuous risk management process are the proactive quest to identify risk events and the reduction of uncertainty that results from developing a plan to deal with the risk events.

It is, at best, difficult and probably impossible to assess every potential area and process. To manage risk, Integrated Project Teams should focus on the critical areas that could affect the outcome of the project. Work Breakdown Structure product and process elements and systems engineering and manufacturing processes should capture most of the significant risk events. Risk events are determined by examining each Work Breakdown Structure element and process in terms of sources or areas of risk. Broadly speaking, these sources generally can be grouped as scope, cost, schedule, and performance, with the latter including technical risk. Some typical Work Breakdown Structure risk areas are below.

- *Requirements Definition*. The sensitivity of the project to uncertainty in the system description and requirements except for those caused by threat uncertainty.

- *Environment, Safety, and Health.* The controls, sensitivities, and impacts that the project has or will have to be dealt with to be effective.

- *Design.* The ability of the system configuration to achieve the project's engineering objectives based on the available technology, design tools, design maturity, etc.

- *Test and Evaluation.* The adequacy and capability of the test project to assess attainment of significant performance specifications and determine whether the systems are operationally effective and suitable.

- *Modeling and Simulation.* The adequacy and capability of these tools to support all phases of a project using verified, valid, and accredited modeling and simulation tools.

- *Technology.* The degree to which the technology proposed for the project has been demonstrated as capable of meeting project objectives.

- *Logistics.* The ability of the system configuration to achieve the project's logistics objectives based on system design, maintenance concept, support system design, and availability of support resources.

- *Safeguards and Security.* The sensitivity of the project to the uncertainty that may result from safeguards and security requirements.

- *Production.* The ability of the system configuration to achieve the production objectives based on the system design, manufacturing processes chosen, and availability of manufacturing resources such as facilities and personnel.

- *Concurrency.* The sensitivity of the project to uncertainty resulting from combining or overlapping life cycle-phases or activities.

- *Capability of Developer/Contractor.* The ability of the developer/contractor to design, develop, and build the system. The contractor should have the experience, resources, and knowledge to produce the system.

- *Cost/Funding.* The ability of the system to achieve the project's life cycle cost objectives. This includes the effects of budget and affordability decisions and the effects of inherent errors in the cost estimating technique(s) used (given that the technical requirements were properly defined).

- *Management Interface/Integration.* The degree to which program/project plans and strategies exist and are realistic and consistent. The Integrated Project Team should be qualified and sufficiently staffed to manage the project.

- *Funding and Budget Management.* The sensitivity that the project has funding and budget changes.

- *Schedule.* The adequacy of the time allocated for performing the defined tasks (e.g., development, production, etc.) This factor includes the effects of programmatic schedule decisions, the inherent errors in the schedule estimating technique used, and external physical constraints.

- *Stakeholder, Legal, and Regulatory.* The sensitivity and degree to which these areas will impact the planning, performance, scope, schedule, and cost of the project.

There are additional areas, such as manpower, systems engineering, quality, etc., that are analyzed during project development. The Integrated Project Team strives to pick the most appropriate areas, while still being inclusive, but not to the point of diluting the effort. The Integrated Project Team may consider these areas for early assessment since failure to do so could cause dire consequences/impacts in the project's latter phases.

14.4.3 Risk Assessment

The degrees to which these details are applicable to the project are unknown at the pre-acquisition planning stage. However, for risk purposes, they can be "expected" and considered in risk evaluation and be identified as potential cost and schedule impacts even if there is only one risk identified. This is sufficient, since an early objective of risk analysis is to establish sufficiently accurate scope, schedule, and cost bases to ensure that the project can be successfully implemented.

While risk assessments should be deliberately performed prior to each phase, assessing the risks must be a continuous conscious, activity as the project evolves. At each decision point, the risks are presented to the Acquisition Executive to ensure that decisions are being made with a full understanding of the significant risks.

Based upon the results of these assessments, the Integrated Project Team can develop and implement risk reduction and mitigation strategies. The assessment results can also be used to develop and implement risk-based acquisition strategies and are fully integrated with the overall Risk Management Plan.

Quantifying risk is an analytical method that weighs the likelihood of a specific risk occurring and the impact or consequence of that occurrence. Risk analysis requires a systems approach and critical thinking. It is qualitative rather than quantitative. The result is a matrix approach which classifies risks in a manner similar to the matrix in Figure 14-2. While decision support systems and tools facilitate a more complete understanding of the likelihood of occurrence, they are not a substitute for qualitative analysis. The reason for classifying risks as shown in Figure 14-2 is evident. It allows managers to focus attention and resources on the possible events that will have the greatest likelihood of occurring and the greatest impact if it does occur. Neither contractors nor Federal officials wish to expend scarce resources in areas where the probability is low and the consequence is negligible.

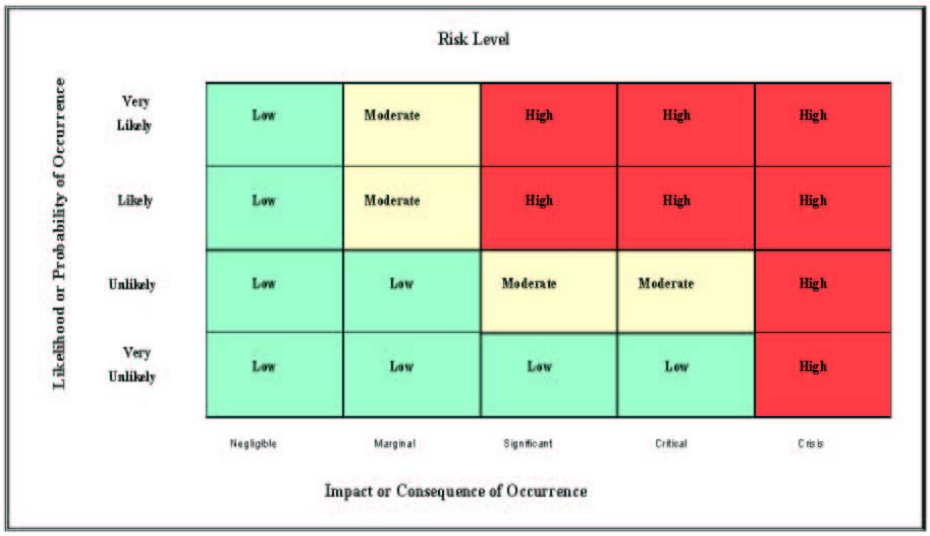


Figure 14-2. Typical Risk Level Matrix

There is a common tendency to attempt to develop a number to portray the risk associated with a particular event. This approach may be suitable if both probability and consequences have been quantified using compatible calibrated scales. In such a case, mathematical manipulation of the values may be meaningful and provide some quantitative basis for the ranking of risks. However, mathematical operations performed on results from uncalibrated scales, often provide information that is misleading, if not completely meaningless, resulting in erroneous risk ratings.

14.4.4 Risk Handling

For each identified risk, the risk handling strategy is formulated to ensure that the necessary actions are being developed and implemented. For each risk identified, a risk handling strategy is developed. The method chosen to handle a risk is specific to that risk. There are no universal mitigation strategies except attempting to buy your way out of the problem. Handling strategies are intended to either avoid the event or to mitigate (minimize the impact) the event. All Department projects are expected to include the estimate for implementing the handling strategies in the budget submission for the project and include this budget as part of the total cost for the project. Where appropriate, a formal gap analysis should be completed to evaluate the risk between project requirements and proven technologies.

While mitigating strategies are innumerable, several common methods are listed.

Schedule

- Adjusting schedules and activities to include additional float
- Long-lead procurement
- Buy vs. make
- Early starts of some activities
- Second sourcing

Cost

- Independent cost estimates
- Additional funding for contingencies
- Value management
- Aggressive cost control

Technical

- Research and development
- Technology development plans
- Laboratory tests and demonstrations
- Prototyping
- Simultaneously pursuing alternative technologies

14.4.5 Confidence Levels as a Risk Handling Approach

While all project budgets should include funds for managing risk within their budget, the project budget should not be viewed as the primary means to deal with risk after a risk event occurs. These funds are intended to be used to pursue the selected mitigation strategies in the Risk Management Plan. For example, conducting research and development to mitigate a specific risk does not mean that the funds are held as contingency until the event occurs. The funds are intended to be used to prevent the event from occurring. Consequently, the risk mitigation effort should be an active work package within the Work Breakdown Structure that is scheduled and executed as part of the project.

Still, estimates contain some uncertainty which translates to risk. A common technique used to evaluate the potential for over or under running within the individual estimates and schedules at various levels, is a probabilistic risk analysis using Monte Carlo simulation. Monte Carlo analysis can provide a relative confidence level in those estimates. Since every one of the many parts that make up an estimate is subject to some uncertainty, the IPT must determine the uncertainty within each Work Breakdown Structure element and the effect this has on the total estimate. The use of probabilistic approaches yields a confidence level that is an indicator of the quality of the estimates. When the confidence level is low, the project must analyze the variables to determine what element(s) of the estimates are weak and require additional examination.

In conducting Monte Carlo analysis, a model of the cost estimate is constructed, addressing all the cost components that make up the estimate, excluding the contingencies (i.e., Estimate Allocation, Technical and Programmatic Risk Assessment Allocation, and Schedule Allocation) which will be subsequently determined. This model (Figure 14-3) represents and reflects the summary logic and approach utilized in preparing the cost estimate. It lists the various cost components of the project, such as labor cost, material cost, equipment cost, indirect/overhead cost, escalation cost, etc. These are known as “terms” in the model. Each cost component has a dollar value, which is its “weight” in the model. Elements that make up and affect each “term” are also listed. These are known as variables in the model. Typical “variables” that are addressed in the model include:

- Scoping
- Quantification
- Labor installation unit rates
- Labor productivity factors (location and work conditions may modify the labor installation unit rates)
- Labor costing rates
- Material pricing
- Equipment pricing

- Subcontract pricing
- Escalation rates
- Indirect/overhead rates

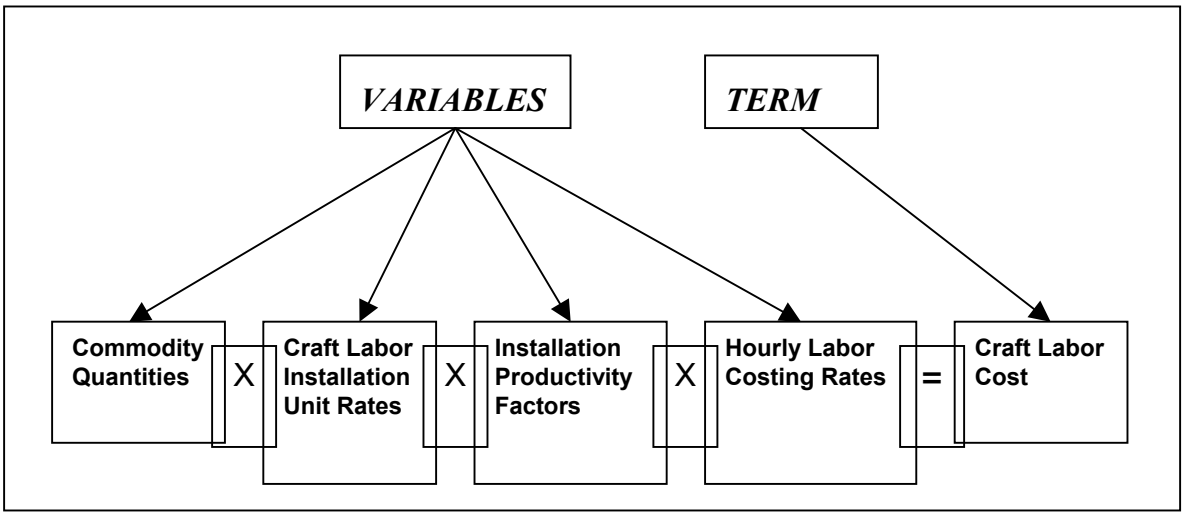


Figure 14-3. Estimate Allocation Analysis.

After the model has been constructed, the estimator and other project team members estimate the confidence levels for each variable. This constructs a probability curve for each variable.

A Monte Carlo simulation computer software program is used which uses a series of searches, sorts, and iterative logic routines to evaluate the data in the model. Utilizing a Monte Carlo simulation technique and the probability distribution of each variable, a variable value is obtained by drawing randomly from the variable's probability distribution. In a similar manner, selections are made for each variable value from its respective distribution. This set of variable values is then substituted into the model and the first sample value of the dependent variable is computed. Subsequent values of the dependent variable are obtained by drawing a large number of sets of activity values (e.g., 1,000 to 2,000 passes through the model). A probability distribution of the estimate is then produced. This information will yield an analysis of the relative risk and probability of overrunning or underrunning the estimated cost.

Outputs from Monte Carlo simulation software may consist of reports and graphs that address:

- Total risk allocation versus probability of overrun
- Probability distribution
- Relative contribution of variables

- Variable distribution versus allocations contribution
- Mean and standard deviation

This information is used by management as a decision-making tool in determining the final estimate and setting the Performance Baseline. When the results of Monte Carlo simulation are significantly different than expert engineering judgment, the Integrated Project Team must determine the source of the disconnect and make corrections prior to setting the Performance Baseline.

14.4.6 Risk Reporting, Tracking, and Closeout

Risk reporting involves documenting risk identification, risk quantification, risk handling strategies, impact determination, and risk closeout.

Risk tracking involves monitoring action items from risk handling strategies/responses, identifying a need to evaluate new risks, and re-evaluating changes to previous risks.

When a project performs an acquisition risk assessment, the results need to be included in the Critical Decision request-for-approval package. When preparing this package, the Project Director may include a discussion of each of the topics identified in the practice. Based upon the project complexity and other factors, the results of the risk assessments performed by the project may be specifically selected for review by OMBE (OECM and Program Analysis & Evaluation). This review, if performed, would be done in support of the other required reviews that are associated with the various critical decisions.

Risk closeout is assigning risk associated action items to a responsible individual and identifying a completion date. Completion dates are tracked and each action item status updated until closeout. The action item tracking system is commensurate with the size and complexity of the project. This process follows the system prescribed in the risk management plan. If deviations prove necessary, they are shown in a revision to that plan. Detailed guidelines for risk handling strategies are provided in the Practice on Risk.

14.5 RISK MANAGEMENT PLAN

The Risk Management Plan is the road map that tells the Federal and contractor team within the risk environment how to effectively implement a new capital asset that meets the mission need. The key to writing a good plan is to provide the necessary information so the Integrated Project Team understands the objectives, goals, and the risk management process. Since it is a map, it may be specific in some areas, such as the assignment of responsibilities for Government and contractor participants and definitions, and general in other areas to allow users to choose the most efficient way to proceed. For example, a description of techniques that suggests several methods for evaluators to use to assess risk is appropriate, since every technique has advantages and disadvantages depending on the situation.

Risk Management Plans often erroneously contain just process information on how the project intends to perform risk management. The Risk Management Plan should contain plan for managing specific project risks that were identified and assessed as part of the risk management process. The plan should identify those specific risks and articulate specific plans to handle the risk whether the chosen method for a specific risk is avoiding the risk, pursuing alternative technologies, second sourcing, or additional research and development. The plan is intended to be specific for that project and those identified risks. The contents of the Risk Management Plan should address the following topics. The list is not all inclusive and only provides the top level topics.

- Introduction
- Project summary
- Definitions
- Identified risks and analysis
- Occurrence and impact determination
- Management approach and strategy
- Responsibilities
- Process and procedures
- Reporting and tracking

CHAPTER 15. CONTRACTING AND CONTRACT MANAGEMENT

15.1 INTRODUCTION AND KEY TERMS

The goal of the DOE procurement system is to obtain high quality products and services in a timely, cost-effective manner, at prices that are fair and reasonable. The procurement system enables DOE to be innovative and creative so that the right contractor is selected to implement a solution. The DOE procurement system is an integrated part of the acquisition process. The DOE procurement system focuses primarily on identifying sources, awarding, and administering contracts.

The DOE procurement system emphasizes competition to select the contractor with the best overall value. Open communication with industry from initial planning to contract award is the cornerstone of the process. Procurement documents tailored to individual requirements improves source selection by focusing efforts on those most likely to receive an award. The procurement system emphasizes "common sense" decision making, flexibility, business judgment, and a team concept for managing procurements. The Integrated Project Teams should have the proper level of authority to make decisions, with responsibility and accountability for their actions.

The DOE procurement system provides policy and guidance for executing contracts and agreements to acquire products and services, including capital assets. The DOE Acquisition Regulations, Acquisition Guide and other procurement guidance documents may be found at the Professionals Homepage, http://www.pr.doe.gov. DOE capital asset projects are executed through contractors. This includes the contract between DOE and the prime contractor(s) as well as subcontracts that are awarded by the prime contractor. This chapter discusses project procurement in the context of Government (DOE) contract management with DOE as the buyer. This chapter covers the following.

- Acquisition Planning – determining what to procure and when
- Solicitation Planning – documenting product requirements and identifying potential
- Sources – obtaining quotations, bids, offers, or proposals as appropriate
- Source Selection – choosing from among potential sellers
- Contract Administration/Management – monitoring the performance of the contractor against the contract requirements
- Contract Closeout – completion and settlement of the contract, including resolution of any open items.

Key terms used in this chapter include the following.

- Best Value

- Contracting Officer
- Performance-based contracting

15.2 FUNDAMENTAL PRINCIPLES

This list is not intended to be all-inclusive. It does, however, highlight some of the key principles in government procurement.

- Select the contractor with the best overall value to satisfy DOE's mission.
- Focus on key discriminators between contractors and their products or services to ensure timely, cost-efficient, and quality contract performance.
- Promote discretion, sound business judgment, and flexibility at the lowest levels while maintaining fairness and integrity.
- Encourage the procurement of commercial and nondevelopmental items.
- Provide streamlined methods and initiate innovative processes to conduct timely and cost-effective procurements.
- Promote open communication and access to information throughout the procurement process, and encourage use of electronic methods for information exchange.
- Encourage competition as the preferred method of contracting.
- Consider contract types best suited to a particular procurement.
- Provide opportunities for small businesses to the maximum extent possible, consistent with their capabilities and Departmental requirements.
- Provide an internal process for resolving protests and disputes in a timely, cost-effective and flexible manner.
- Promote high standards of conduct and professional ethics.
- Require appropriate documentation to support business decisions.
- Require performance management systems that provide accurate and reliable information.
- Focus on key performance indicators and resolve issues immediately.
- Ensure adequate checks and balances.
- Ensure public trust.

15.3 U.S. GOVERNMENT CONTRACTS

In U.S. Federal procurement, three clauses in the contract that provide the government with superior rights generally not found in commercial contracts are Changes, Disputes, and Terminations for Convenience. The Changes clause permits DOE to unilaterally order changes for contractor compliance provided that such changes lie within the scope of the contract. While the contractor is entitled to an equitable adjustment in cost and schedule as a result of the changes, he must perform the changes upon receipt of the change order(s). The Disputes clause permits the Government contracting officer to issue a final decision concerning issues in dispute between the parties. While the contractor may appeal the decision to an administrative or judicial forum, he must comply with the decision pending review to avoid breach of contract. The Terminations for Convenience clause permits the Government to terminate the contract, in whole or in part, for its convenience, usually because the requirement has major changes or the funding for the contract has been eliminated. While the contractor is entitled to payment for performance to date, he has no recourse to the courts to require continued performance of the contract absent arbitrary or capricious action on the part of governmental agents.

15.4 ACQUISITION PLANNING

Federal Acquisition Regulation (FAR) 7.102(b) states that the purpose of acquisition planning is to ensure that the government meets its needs in the most effective, economical, and timely manner. Acquisition planning is the process of identifying and describing requirements and determining the best method for meeting those requirements. An important step in acquisition planning is identification of the Integrated Project Team. For a major acquisition, participants normally include the Project Director, Contracting Officer, technical experts, logisticians, financial and legal personnel. However, this team can be tailored to meet specific project needs. Acquisition planning focuses on the business and technical management approaches designed to achieve project objectives within specified resource constraints and the contracting strategies necessary for implementation. When the prime contractor is responsible for executing subcontract acquisition planning, the Integrated Project Team should review the plans for significant procurements in collaboration with the prime contractor. On some contracts, the acquisition plans for significant procurements are required to be submitted to the government for review prior to announcement or award.

Acquisition planning is an indispensable component of the total acquisition process. Integrated Project Teams use acquisition planning as an opportunity to review and evaluate the entire procurement process, so that sound judgments and decision making will facilitate the success of the overall project. Specific contract acquisition planning should be appropriate and proportionate to the complexity and dollar value of the requirement. A plan for each contemplated contract or class of procurements should address the significant considerations of the procurement action. An acquisition plan may cover more than one contract. The contract acquisition plan represents the Integrated Project Team agreement for conducting the procurement. The written acquisition plans are comprehensive and intended to facilitate attainment of the acquisition objectives by addressing milestones and other significant considerations that will control the acquisition. The Project Director has overall responsibility for acquisition planning when the Department will directly contract for the acquisition.

Understanding the major technical, cost, and schedule project risks to successful completion of the project is a significant factor for the Integrated Project Team decision makers. Risk Management is a special topic discussed in detail elsewhere in this Manual. The major types of contracts and incentives proposed should be based on an overall view of major project risk. Fixed-price type contracts are not appropriate for research and development efforts or other complex projects where there is a high degree of uncertainty in the execution or DOE requirements. Fixed-price is appropriate where the level of risk permits realistic pricing and an equitable allocation of the risk consequences between the parties. Generally, DOE's M&O contracts are cost-plus-award-fee with performance incentives negotiated annually.

15.5 SOLICITATION PLANNING

DOE can obtain best overall value in negotiated procurements by using any one or a combination of source selection evaluation criteria. In different types of procurements, the relative importance of cost or price may vary. For example, in procurements where the requirement is clearly definable and the risk of unsuccessful contract performance is minimal, cost or price may play a dominant role in source selection. The less definitive the requirement, the more development work required, or the greater the performance risk, the more technical or past performance considerations may play a dominant role in source selection.

Exchanges of information among all interested parties, from the earliest identification of a requirement through receipt of proposals, are encouraged. Any exchange of information must be consistent with procurement integrity requirements. Interested parties include potential offerers, end users, government acquisition and supporting personnel, and others involved in the conduct or outcome of the acquisition. The purpose of exchanging information is to improve the understanding of government requirements and industry capabilities, thereby allowing potential offerers to judge whether or how they can satisfy the government's requirements, and enhancing the government's ability to obtain quality supplies and services, including construction, at reasonable prices, and increase efficiency in proposal preparation, proposal evaluation, negotiation, and contract award.

Some of the key planning documents included in the solicitation are the Statement of Work, Statement of Objectives, or Performance Work Statements where DOE task requirements are expressed. The Statement of Work placed on contract serves as a basis to measure contractor progress. Programs may promote early exchanges of information about future acquisitions. An early exchange of information among industry and the Project Director, Contracting Officer, and other participants in the acquisition process can identify and resolve concerns regarding the acquisition strategy, including proposed contract type, terms and conditions, and acquisition planning schedules; the feasibility of the requirement, including performance requirements, Statements of Work, and data requirements; the suitability of the proposal instructions and evaluation criteria, including the approach for assessing past performance information; the availability of reference documents; and any other industry concerns or questions. Some techniques to promote early exchanges of information are:

- Industry or small business conferences
- Market research

- One-on-one meetings with potential offerors
- Presolicitation notices
- Draft requests for proposals
- Requests for information
- Pre-solicitation or pre-proposal conferences
- Site visits

DOE posts solicitations on a government-wide point of entry site known as Fed Biz Opps (www.fedbizopps.gov). Contracting Officers post a synopsis and the solicitation package, so that interested suppliers do not have to contact the contracting activity for copies. Many of our prime contractors supporting projects post planned subcontracts on their websites listing pre-qualification criteria and other applicable data for subcontractors.

Incentives Strategies

The Department recognizes that a mutual commitment by both industry and government is required to create a cooperative atmosphere for information exchange. Information exchange feeds the joint development of the acquisition (procurement) business case through which both government and industry articulate their motivations, goals, barriers, and enablers. Once the relationship has been established and the business case clearly understood, incentives can be structured to motivate mutually desired behaviors and outcomes. Understanding the motivation is at the crux of formulating performance incentives. Incentives are a critical aspect of performance-based contracting. Care must be given that performance incentives are in line with the objectives of the contractor. Reputation, opportunity, and prestige are more often a currency of greater value to universities or non-profits than a for-profit contractor with shareholders. Often, incentives can be found that do not require a direct outlay of funds. Repeat business earned as a result of successful performance provides security to businesses. Past performance selection criteria is an incentive built in to the solicitation process.

Commercial Item Acquisition

Expanding the use of commercial items in DOE systems offers opportunities for reduced cycle time, faster insertion of new technology, lower life-cycle costs, greater reliability and availability, and support from a more robust industrial base. It is a fact that for many of the technologies critical to DOE, the commercial marketplace—not DOE—drives the pace of innovation and development. The use of commercial items in DOE is the preferred approach for meeting requirements. Simply put, if the Department intends to field state-of-the-art systems in a cost-effective manner, then it must incorporate commercial items into these systems.

Intellectual Property

The acquisition community should consider certain core principles when dealing with industry intellectual property (IP). As used here, the term "IP" means patents, copyrights, trademarks, and trade secrets. The government has promulgated policies and regulations on copyrights, patents, technical data, and computer software. In the government's acquisition of IP license rights, it should consider certain principles highlighted below:

- Integrate IP considerations fully into acquisition strategies for advanced technologies in order to protect core DOE interest.
- Respect and protect privately developed IP because it is a valuable form of intangible property critical to the financial strength of a business.
- Resolve issues prior to award by clearly identifying and distinguishing the IP deliverables from the license rights in those deliverables.
- Negotiate specialized IP provisions with your legal counsel whenever the customary deliverables or standard license rights do not adequately balance the interest of the contractor and the government.
- Seek flexible and creative solutions to IP issues with your legal counsel, focusing on acquiring only those deliverables and license rights necessary to accomplish the acquisition strategy.

Independent Estimates

FAR 36.203 requires that an independent government estimate of construction costs be prepared and furnished to the contracting officer at the earliest practicable time for each proposed contract and for each contract modification anticipated to cost $100,000 or more. Additional acquisition guidance suggests that a source selection evaluation report also address cost or price comparison to the independent government cost estimate to determine cost effectiveness and cost reasonableness.

OMB Circular No. A-11, Part 7, *Planning, Budgeting, Acquisition and Management of Capital Assets,* states that life-cycle costs means the overall estimated cost for a particular program alternative over the time period corresponding to the life of the program, including direct and indirect initial costs plus any periodic or continuing costs of operation and maintenance. That guidance also states new projects must be justified based on the need to fill a gap in the agency's ability to meet strategic goals and objectives with the least life-cycle costs of all the various possible solutions and provide risk adjusted cost, schedule goals, and measurable performance benefits. For DOE, those life-cycle costs should include costs of dismantling and demolition at project completion.

15.6 EVALUATION AND SELECTION

Proposal evaluation is an assessment of the contractor's proposal and the offerer's ability to perform the prospective contract successfully. The source selection team should evaluate competitive proposals and then assess their relative qualities solely on the factors and subfactors specified in the solicitation. Evaluations may be conducted using any rating method or combination of methods, including color or adjectival ratings, numerical weights, and ordinal rankings. The relative strengths, deficiencies, significant weaknesses, and risks supporting proposal evaluation shall be documented in the contract file. Evaluations must include cost or price criteria and past performance data, and may include technical and small business contracting criteria.

Each request for proposal or bid package contains the specific evaluation criteria to evaluate offerer proposals. Past performance is an evaluation factor in all selection decisions for all complex and noncommercial source selections. All official source selection decisions should be based on the evaluation criteria established in each request for proposal. Cost or price considerations must be an evaluation factor in all selection decisions with a requirement for a formal cost or price proposal.

The Contracting Officer must have warrant authority commensurate with the estimated value of the procurement. Awards are made to responsible contractors only. To be determined responsible, a prospective contractor should have:

- Adequate resources (financial, technical, etc.) to perform the contract, or the ability to obtain them
- Ability to comply with the required or proposed delivery or performance schedule, considering all existing business commitments
- Satisfactory performance record
- Satisfactory record of integrity and business ethics
- Qualifications and eligibility to receive an award under applicable laws and regulations

The Contracting Officer's signing of the contract constitutes a determination that the prospective contractor is responsible with respect to that contract. If an offer is rejected because the prospective contractor is not responsible, the Contracting Officer makes a determination of responsibility. The Contracting Officer is given great discretion in making this determination.

15.7 CONTRACT MANAGEMENT AND ADMINISTRATION

The objective of contract management and administration is to monitor the performance of the contractor against contract requirements to enable timely corrective action. Contract management is an active process with participation of the entire Integrated Project Team. This list is not all inclusive of contract management activities.

- Evaluate contractor performance or deliverables.
- Verify and document evidence of actual or potential performance problems, constructive changes, or other deviations.
- Determine potential impact of technical issues on cost, schedule, and delivery; and investigate/resolve rationale for potential or actual delays.
- Specify technical criteria for the quality of the product, in-process test procedures and test points, and acceptance criteria through engineering analysis.
- Assess performance, quality, and other technical issues and provide technical evaluation to contracts for adjustment to, modification of, or compliance with the contract.
- Analyze performance data for trends and issues. Resolve issues in data quality and performance quality.
- Monitor the risk management process to identify technical risk, as well as cost, schedule, and performance risk.
- Review change proposals and alterations impacts on cost and schedule to ensure that adequate funding is available and that schedules imposed in the contract are not affected.
- Review requests for waivers and deviations from contractor and field activities to determine the impact on system reliability and performance, as well as on cost and schedule.
- Review change proposals for need, technical adequacy of design, consistency with program objectives, impact on operations, producibility, quality and similar programmatic concerns; and ensure that proposed changes are within the scope of the contract.
- Conduct a cost-benefit analysis of the Value Engineering Change Proposal.
- Participate in design review planning meetings, in the event of potential impact to the contract (e.g., constructive change clauses, etc.) and conduct design reviews.
- Support baseline reviews process.
- Track corrective actions and interfaces with the contractor during project reviews until they are complete.
- Ensure compliance with the configuration management requirements of the contract and consistency with the acquisition strategy, such as the decision to buy data rights or other strategies to ensure that a second source can build the hardware.
- Assess the impact of stop work orders on contractor performance of the technical and programmatic requirements. Recommend stop work when contractor deficiencies are

expected to result in delivery of nonconforming technical products. Evaluate contractor proposals to stop work for technical reasons.

- Ensure that Architect-engineer contractors are responsible for the professional quality, technical accuracy, and coordination of all services required under their contracts and that firms are held liable for Government costs resulting from errors or deficiencies in designs furnished under its contract.

15.8 CONTRACT CLOSEOUT

The objective is to administer contract closeout and termination with equitable results for both the government and the contractor. Many contracts may not actually close at the completion of the project because the prime contractor is responsible for more work than just a single project. When the contract is not being closed out, project closeout activities must still be accomplished. Typical activities during contract closeout include:

- Settle all outstanding claims, issues or disputes; respond to contractor claims for additional money or contract adjustment, and determine if it constitutes a payable claim.
- Verify that the contract is physically complete through physical and functional configuration audits.
- Obtain all forms, reports, and clearances required at closeout from both government and contractor activities, and ensure that they have met all applicable terms and conditions for closeout.
- Make final payment and de-obligate funds, if any.
- Prepare contract completion documentation.
- Assist Contracting Officers in determining the status of technical terms and conditions of the contract.
- Assist Contracting Officers in identifying or settling unresolved issues, such as performance issues, unresolved Value Engineering Change Proposals, etc.
- Dispose of government furnished property.

15.9 PERFORMANCE-BASED CONTRACTING

Performance-based service contracting emphasizes that all aspects of an acquisition be structured around the purpose of the work to be performed as opposed to the manner in which the work is to be performed. The contractors are given the freedom to determine how to meet the government's performance objectives and achieve the appropriate performance quality levels. Payment is made only for services that meet these levels.

Substantial requirements and guidance on performance-based service contracting is available from many sources. This section does not attempt to repeat all that guidance, but instead offers a snapshot on how to integrate performance-based acquisition into the acquisition of capital assets. As taken from FAR 2.101:

"Performance-based contracting" means structuring all aspects of an acquisition around the purpose of the work to be performed with the contract requirements set forth in clear, specific, and objective terms with measurable outcomes as opposed to either the manner by which the work is to be performed or broad and imprecise statements of work."

FAR 37.6 identifies five elements of performance-based contracting.

- Statements of Work
- Quality Assurance
- Selection Procedures
- Contract Type
- Follow-on and Repetitive Requirements

At a high level, these are the activities that need to be developed, planned, and executed successfully within a given project and its procurements. From a project perspective, these elements are part of the plans and decision processes required as part of various project activities.

The following seven-step process is adapted from existing government information on performance-based contracting. It is important to note that Integrated Project Teams need to be well-trained in performance-based contracting approaches and updated in lessons learned experiences that may be incorporated, in real time, into any project undertaking.

Step 1. Establish an Integrated Project Team. This is sometimes referred to as an integrated solutions team, since their fundamental purpose is to find performance-based solutions to agency mission and program needs.

Step 2. Describe and develop the problem that needs to be solved, and the link to the Department's Strategic Plan and objectives. A clear vision of the need and the requirements leads to the definition of what performance will be necessary to meet the requirement. A performance-based picture of the acquisition is to be the team's first step. However, it is not yet time to retrieve the requirements from former solicitations, search for templates, think about contract type, incentives, or decide on the contractor or the solution. This effort results in a need and functional requirements and includes early preliminary planning documents such as the initial acquisition strategy, risk comparisons, and potential alternatives.

Step 3. Examine the potential solutions from both private and public sectors. This is called "market research," and it is a vital means of arming the team with the expertise needed to conduct an effective performance-based acquisition. The entire Integrated Project Teams needs to have a common understanding of what features (high-level objectives, functions, and

constraints), schedules, terms, and conditions are keys to the potential solution. Picking a specific solution is to be resisted and adequate planning time allowed to carry out the next two steps. This may include the entire project Definition Phase (selecting, preparing, and delivering the concept), or may be done during any phase as necessary to support a procurement. An example would be preparing for a conceptual design contract, technology development, or a site characterization effort.

Step 4. Develop performance work statements for the work to be accomplished. This work statement is included in solicitations or in the work authorizations used to task existing contractors. Let the contractor propose solving the problem, including the labor mix. This statement will satisfy the next step as well as the requirements of OMB A-11. Below this level, performance work statements and/or statement of objective documents are used as part of the request for proposals. The statement of objective is a very short document that provides the basic, high-level objectives of the acquisition. In this approach, the contactors' proposals contain statements of work and performance metrics and measures. Use of a statement of objectives opens the acquisition up to a wider range of potential solutions. For a large, complex project this may take multiple contracts, but for a noncomplex project it may be developed into one bid by a prime contractor and eventually performed by a single contractor.

Step 5. Decide how to measure and manage performance. Measuring and managing performance is a complex process and requires the consideration of many factors. These factors include performance standards and measurement techniques, performance management approach, incentives, and more. Best practices in this area include reliance on commercial quality standards, have the contractor propose the metrics and the quality assurance plan, consider use of incentive tools, and selection of only a few meaningful measures on which to judge success. Progress is performance for which the contractor is responsible. Communicating progress for projects is one element of the Earned Value Management System.

Step 6. Select the right contractor(s). Bringing the acquisition strategy to fruition by executing the strategy and selecting the right contractor is especially important in performance-based contracting. The contractor must understand the functional and performance requirements and have the capability to perform. This is not merely the technical ability. The contractor must also have the business and technical management capability and the ability to integrate activities in a complex endeavors. Finally, the contractor must have the support processes (safety, engineering, quality, procurement, etc.) and resources in place to support the Department's objectives and requirements.

Step 7. Manage performance. During the project Execution and Transition/Closeout Phases, management systems are used to monitor, manage, and report performance. This includes appropriate reviews, performance measures, and reporting. Performance is not merely doing the work right, it is also doing the work the right way. While the Department may not direct how something is to be accomplished/achieved, there are statutes, standards, and regulations regarding work processes and the government's role in monitoring the performance of those processes.

The above steps do not intend to highlight the entire project process—they are designed to help the Project Director and the Integrated Project Team understand how to integrate the two concepts.

15.10 LESSONS LEARNED

This subsection includes a compilation of selected lessons learned from previous acquisition experiences. It is provided to highlight a variety of contracting and contract management issues and practices that may help the Project Director and Integrated Project Team as they develop, execute, and manage contracts.

Acquisition Planning

- Schedules that do not allow sufficient time to obligate funds.
- Not completing initial pre-procurement conferences and acquisition planning efforts prior to development of the solicitation documents.
- The improper use of sole source justification to expedite contract award.
- Use of a standard source selection plan. During acquisition planning, the source selection plan should be developed based on project requirements. Consider the use of options (tying the exercise of them to development milestones where possible).

Purchase Requests

- Not including independent government cost estimates with the purchase request.
- Justifications and/or waivers which are not adequately documented.
- Quantities or units not consistent with the requirement.
- Unreasonable cost estimates, given the requiring activity's supporting data.
- Descriptions that are vague, ambiguous, overly restrictive or insufficiently restrictive.
- Vague inspection and acceptance criteria or testing procedures.
- Special contract administration requirements that are vague, ambiguous, overly restrictive, or not consistent with the specification, statement of work, or that require special contract administration.

Market Research

- Trade studies not traceable to the requirements and associated design requirements.
- The use of new technologies without conducting trade studies to identify risks.

- Trade studies that do not include participation by appropriate engineering disciplines.
- Commercial suppliers with no documentation to support their claims for product performance, reliability, and logistics support.
- Product reliability, quality, and supportability requirements being traded for cost, schedule, and functional performance gains.

Competition

- Noncompetitive acquisitions that cannot be justified. Check for suppliers and data that could enable a competitive acquisition. If the item is clearly sole source, justification should be presented from the beginning.
- Insufficient research into portions of larger competitive or noncompetitive procurements. Review for potential Small Business Innovative Research, set-asides, or small business competition. Encourage prime contractors to subcontract in areas they do not have expertise.
- Project definition and risk reduction not structured so prototypes of competing systems are produced and tested to enable design selection before starting preliminary design or development. Design competition is expensive and the longer design competition is continued the more expensive it becomes.
- Techniques for controlling and reducing costs which do not consider the following:

  —Subcontract competition

  —Component/subsystem breakout

  —Aggressive value management

  —Use of incentive or award fee contracts

  —Should-cost analysis of the sole source prime

  —Product improvement of existing item

  —Use of commercial off the shelf/non development items

  —The source selection plan not finalized prior to issuance of the request for proposal

Solicitation

- Statement of Work/Statement of Objectives that do not include sufficient emphasis on risk management.

- Evaluation factors and subfactors different from the source selection plan.
- A source selection plan that does not address the following:

  —An adequate description of all the factors/subfactors to be considered in making the selection.

  —Minimum requirements that apply to particular evaluation factors/subfactors that have to be met.

  —The cost factors between thresholds and goals.

  —A clear explanation of how goals or features will be evaluated and whether or not credit will be given in the evaluation for exceeding such desirables.

  —A linkage between solicitation requirements, each evaluation factor and subfactor and the proposal preparation instructions.

Award Fee and Performance Incentives

- No regular structured feedback to prime contractors on their performance with respect to fee criteria at significant project reviews.
- No fee flow down to subcontractors where appropriate.
- Award fee contracts based on contractor process improvements without objective measurements as a basis for evaluation and award fee determination.
- Relatively short contract performance periods, making it difficult to establish a metric baseline, implement a process change and validate an improvement in the resulting metric during the contract period.
- Award Fee element not linked to the Statement of Work/Statement of Objectives.
- Incentives which require government performance for the contractor to earn fee

Warranties

- Warranties that are, in effect, fixed-price maintenance agreements.

Subcontractor Control

- Acquiring critical material from an unapproved source.
- Supplier performance ratings that do not consider the increased cost for latent defects.
- Subcontractor performance ratings based primarily on cost, schedule and receiving inspection vice performance requirements.

- Subcontractor process capability that has not been verified.
- Delinquent subcontractor decertification processes.
- Design Reviews.
- Design review boards staffed with managers rather than technical experts. This may result in a lack of technical focus.
- Design reviews that are schedule oriented, rather than technical maturity oriented.
- Informal reviews that fail to define roles, document and track results, and define exit criteria.
- Developing test and inspection points without a knowledge of contractor critical processes.
- Insufficient planning and preparation prior to the review.

Configuration Management

- Request for proposal preparation instructions which do not have Configuration Management as a key management and past performance discriminator. The weighting of the request for proposal evaluation criteria should reflect the importance of an effective, documented contractor configuration management process as a risk mitigator.
- Interface and inter-operability requirements which are not defined for the lowest repairable units consistent with the maintenance philosophy.
- Contracts that give the contractor control of critical or major waivers, deviations, or Class I engineering changes.
- Project plans and budgets which do not include early planning for purchase of the data rights as appropriate

CHAPTER 16. SPECIAL CONSIDERATIONS

16.1 Introduction

The diversity of projects within the Department makes it impossible to create a single model that will fit every circumstance. While the basic framework supports a large majority of capital asset acquisition projects, there are situations that exist where the model must be tailored to fit a different type of asset or method of delivering the capability. This chapter discusses special circumstances and methods.

16.2 Design Build

Design-Build is a project delivery method where a single contract is awarded for both design and construction. Design-Build is typically used for projects where construction is the primary activity and the facility, building, modification, or related end item is obtained through construction activities that would normally use architect-engineer services. Design-Build is in contrast with Design-Bid-Build where the architect-engineer contract is separate from the construction contract. In Design-Bid-Build, a mature design prepared under the architect-engineer contract is used as a basis for the solicitation and award of the construction contract. Contractually, Design-Build uses a single point of responsibility for both the design and construction services. The FAR (Part 36) recognizes a two-step process for Design-Build acquisitions. This two-step process involves a Request for Qualifications followed by a Request for Proposals.

16.2.1 Design-Build Applicability

Design-Build can be used most successfully with projects that have well-defined requirements, are not complex, and have limited risks. The Design-Build approach requires the development of a functional design and clearly stated operating requirements that provide sufficient information to allow prospective contractors to prepare bids or proposals, but also allows them the flexibility to implement innovative design and construction approaches, value engineering, and other cost and time savings initiatives. This overall objective of the Design-Build approach is to reduce the total cost to the government and deliver projects more quickly than the traditional Design-Bid-Build approach.

16.2.2 Design-Build Process

Projects for which Design-Build is an appropriate delivery method will generally have clear and well-defined requirements early in the process. Accordingly, at the time of Critical Decision-0, much of the cost and schedule information is known along with key design criteria. For such projects, Critical Decision-0, Approve Mission Need, and Critical Decision-1, Approve Alternative Selection and Cost Range, may be accomplished simultaneously. Essentially, in

requesting a simultaneous approval for mission need and alternative selection, the Integrated Project Team is asserting that:

- There is no advantage to the government of further evaluation of alternatives.
- The project functions and requirements are well known.
- A reasonable cost and schedule range can be established.

Approval of Critical Decision-0 and Critical Decision-1 establishes Design-Build as the project delivery method and allows the project to go forward with development of sufficient design work to establish the Performance Baseline and solicitation package. Because of the maturity of the requirements, the lack of complexity, and the cost and schedule knowledge gained from similar efforts, establishing the Performance Baseline may be expedited. In most cases, the authorization to execute the project (Critical Decision-3) may be requested simultaneously with establishing the Performance Baseline (Critical Decision-2). A tailored External Independent Review would be accomplished to support validation of the Performance Baseline.

Design-Build projects generally will not use Project Engineering Design funds. The Project Data Sheet should be submitted for the budget year in which the Design-Build contract is to be awarded and must include the costs of design as part of the Total Project Cost. The program office may budget for PED funds if there is a need to develop significant performance or technical specifications for the project.

APPENDIX A. ACRONYMS AND GLOSSARY

AE	Acquisition Executive
ANSI	American National Standards Institute
AS	Acquisition Strategy
CBB	Contract Budget Baseline
CD	Critical Decision
CDR	Conceptual Design Report
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFO	Chief Financial Officer
CFR	Code of Federal Regulations
CO	Contracting Officer
COTS	Commercial Off-the-Shelf
CY	Calendar Year
DEAR	Department of Energy Acquisition Regulation
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE-MR	U.S. Department of Energy Management Reserve
EIA	Electronic Institute of America
EIR	External Independent Review
EIS	Environmental Impact Statement
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
ESAAB	Energy Systems Acquisition Advisory Board
EVMS	Earned Value Management System
FAR	Federal Acquisition Regulations
FONSI	Finding of No Significant Impact
FY	Fiscal Year
FYP	Future Year Program
GPRA	Government Performance and Results Act
ICE	Independent Cost Estimate
ICR	Independent Cost Review
IMS	Integrated Master Schedule

IOC	Initial Operating Capability
IPABS	Internal Planning, Accountability, and Budget System
IPL	Integrated Priority List
IPR	Independent Project Review
IPS	Integrated Project Schedule
IPT	Integrated Project Team
IR	Independent Review
ISM	Integration Safety Management
ISMS	Integrated Safety Management System
ISO	International Standards Organization
IT	Information Technology
KPP	Key Performance Parameter
LCAM	Life-Cycle Asset Management
MNS	Mission Need Statement
MS	Major System Project
NEPA	*National Environmental Policy Act*
NNSA	National Nuclear Security Administration
NQA-1	National Quality Assurance Standard – 1
NRC	National Research Council
OBS	Organizational Breakdown Structure
OECM	Office of Engineering and Construction Management
OMB	Office of Management and Budget
OMBE	Office of Management, Budget and Evaluation
OPC	Other Project Costs
ORR	Operational Readiness Review
OSHA	Occupational Safety and Health Administration
PARS	Program Assistant Secretaries
PB	Performance Baseline
PBC	Performance-Based Contract
PDS	Project Data Sheet
PED	Project Engineering and Design
PEP	Project Execution Plan
PMB	Performance Measurement Baseline
PMCDP	Program/Project Management Career Development Program

PPBES	Planning, Programming, Budgeting and Execution System
QA	Quality Assurance
QAP	Quality Assurance Plan
QAPP	Quality Assurance Program Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RD	Requirements Document
RFA	RCRA Facility Assessment
RFI	RCRA Feasibility Investigation
RFP	Request for Proposal
RFQ	Request for Quotations
ROM	Rough Order of Magnitude
SAE	Secretarial Acquisition Executive
SI	Site Investigation
SOW	Scope of Work
TEC	Total Estimated Cost (Capital)
TPC	Total Project Cost
VM	Value Management
WA	Work Authorization

GLOSSARY

The following is a list of definitions of terms that are unique or nearly unique to project management. Also included are terms that are not unique to project management, but are used differently or with a narrower meaning than in general everyday usage. Many of the terms have broader, or sometimes different, dictionary definitions.

Acceptance Testing. The performance of all testing necessary to demonstrate that the completed effort operates in accordance the defined requirements, plans and specifications, including reliability, maintainability, availability.

Accrual Basis. Method of ACCOUNTING that recognizes REVENUE when earned, rather than when collected. Expenses are recognized when incurred rather than when paid. Accrual Basis accounting is essential to accurate performance and progress information on contracts.

Acquisition Executive (AE). The individual designated by the Secretary of Energy to integrate and unify the management system for a program portfolio of projects, and implement prescribed policies and practices.

Performance Baseline. The collected key performance, scope, cost and schedule parameters, which are defined for all projects. The Performance Baseline defines the threshold and boundary conditions for a project.

Acquisition Strategy. An acquisition strategy is a high-level business and technical management approach designed to achieve project objectives within specified resource constraints. It is the framework for planning, organizing, staffing, controlling, and leading a project. It provides a master schedule for activities essential for project success, and for formulating functional strategies and plans.

Acquisition Program or Project. Acquisition programs and projects are acquisitions of capital assets, equal to or greater than $5 million, regardless of the funding source, that deliver a product, or capability, with a specified beginning and end, a stated cost, and expected performance objectives. They are directed, funded efforts whose purpose is to provide a useful, material capability in response to a validated mission or business need. An acquisition program may be facility construction, infrastructure repairs or modifications, system, production capability, remediated land, closed site, disposal effort, software development, information technology, space system, research capability, or other asset. Acquisition programs, as they related to projects, are generally made up of multiple projects, related by a common mission, in which each project remains a useful segment and able to perform it's intended function.

Actual Cost of Work Performed (ACWP). Total costs incurred (direct and indirect) in accomplishing an identified element or scope of work during a given time period. See also EARNED VALUE.

Beneficial Occupancy Date. The process by which a facility or portions thereof is released for use by others, prior to final acceptance. Non-integral or subsidiary items and correction of design inadequacies subsequently brought to light may be completed after this date.

Deviation. A deviation occurs when the current estimate of a performance, technical, scope, schedule, or cost parameter is not within the threshold values of the Performance Baseline for that parameter. It is handled as a deviation, not through the normal change control system.

Budget at Completion (BAC). The total authorized budget for accomplishing the scope of work. It is equal to the sum of all allocated budgets plus any undistributed budget. (Management Reserve is not included.) The Budget at Completion will form the Performance Baseline.

Budgeted Cost of Work Performed (BCWP). A measurement of the work completed (in Earned Value Management terminology). BCWP is the value of work performed, or "earned", when compared to the original plan, that is, the Budgeted Cost of Work Scheduled. The BCWP is called the Earned Value.

See also EARNED VALUE.

Budgeted Cost of Work Scheduled (BCWS). The sum of the budgets for all work (work packages, planning packages, etc.) scheduled to be accomplished (including in-process work packages), plus the amount of level of effort and apportioned effort scheduled to be accomplished within a given time period. Also called the Performance Measurement Baseline. See also EARNED VALUE.

Budgeting. The process of translating resource requirements into a funding profile.

Burden. Costs that cannot be attributed or assigned to a system as direct cost. An alternative term for Overhead.

Burn Rate. The monthly rate at which a contractor's funds are expended during the period of the contract.

Capability. A measure of the systems' ability to achieve mission objectives, given the system condition during the mission.

Capital Assets. Land, structures, equipment, systems, and information technology (e.g., hardware, software, and applications) that are used by the Federal Government and have an estimated useful life of 2 years or more. Capital assets include environmental restoration (decontamination and decommissioning) of land to make useful leasehold improvements and land rights, and assets whose ownership is shared by the Federal Government with other entities. This does not apply to capital assets acquired by State and local governments or other entities through DOE grants.

Configuration Control Board. A multi-discipline functional body of representatives designated and chartered by the appropriate management level to ensure the proper definition, coordination, evaluation, and disposition of all proposed changes.

Change Order. A unilateral order, signed by the government contracting officer, directing the contractor to make a change that the *Changes clause* authorizes without the contractor's consent.

Commercial Item. A commercial item is any item, other than real property, that is of a type customarily used for nongovernmental purposes and that has been sold, leased, or licensed to the

general public; or has been offered for sale, lease, or license to the general public; or any item evolved through advances in technology or performance and that is not yet available in the commercial marketplace, but will be available in the commercial marketplace in time to satisfy the delivery requirements under a government solicitation. Also included in this definition are services in support of a commercial item, of a type offered and sold competitively in substantial quantities in the commercial marketplace based on established catalog or market prices for specific tasks performed under standard commercial terms and conditions; this does not include services that are sold based on hourly rates without an established catalog or market price for a specified service performed.

Commercial Off-The-Shelf (COTS). Commercial items that require no unique government modifications or maintenance over the life cycle of the product to meet the needs of the procuring agency.

Commitment. An administrative reservation of funds by the comptroller in anticipation of their obligation. Based upon firm procurement directives, orders, requisitions, authorizations to issue travel orders, or requests.

Change Proposal. The instrument prepared to provide a complete description of a proposed change and its resulting impact on project objectives.

Chart of Accounts. Any numbering system used to monitor project costs by category (e.g., labor, supplies, materials). The project chart of accounts is usually based upon the corporate chart of accounts of the primary performing organization, and is directly linked to the project's work breakdown structure. See also CODE OF ACCOUNTS.

Competition. An acquisition strategy whereby more than one contractor is sought to bid on a service or function; the winner is selected on the basis of criteria established by the activity for which the work is to be performed. The law and DoD policy require maximum competition throughout the acquisition life cycle.

Competitive Proposals. A procedure used in negotiated procurement that concludes with awarding of a contract to the offerer whose offer is most advantageous to the government.

Commissioning. Commissioning is a systematic process for achieving, verifying, and documenting that the performance of the facility or system and its various components meet the design intent and the functional and operational needs of the owners, users, and occupants.

Commitment. A reservation of funds, prior to creation of an obligation. A commitment is based upon a valid request for procurement that authorizes the creation of an obligation without further recourse to the official responsible for ensuring the availability of funds.

Conceptual Design. The concept for meeting a mission need. The conceptual design process requires a mission need as an input. Concepts for meeting the need are explored and alternatives considered arriving at the set of alternatives that are technically viable, affordable and sustainable.

Configuration. The functional and/or physical characteristics of hardware, firmware and/or software, or any of their discrete portions, as set forth in technical documentation and achieved

in a product. Configuration items may vary widely in complexity, size, and type, from a facility, electronic, or control system to a test meter or process vessel. Any item required for logistic support and designated for separate procurement is a configuration item.

Configuration Management. The technical and administrative direction and surveillance actions taken to identify and document the functional and physical characteristics of a configuration item; to control changes to a configuration item and its characteristics; and to record and report change processing and implementation status.

Construction Management. Services that encompass a wide range of professional services relating to the management of a project during the pre-design, design, and/or construction phases. The types of services provided include development of project strategy, design review relating to cost and time consequences, value management, budgeting, cost estimating, scheduling, monitoring of cost and schedule trends, procurement, observation to ensure that workmanship and materials comply with plans and specifications, contract administration, labor relations, construction methodology and coordination, and other management efforts related to the acquisition of construction.

Contingency. Contingency is the portion of project budget that is available for uncertainty within the project scope but outside the scope of the contract. That is, contingency is budget that is not place on contract.

Contract. A contract is a mutually binding agreement that obligates the seller to provide the specified product and obligates the buyer to pay for it.

Contract Advance Funding. Obligations to a contract or project, to cover future work or materials not yet ordered. The value of advanced funding is the difference between uncosted obligation and unfilled orders outstanding.

Contract Closeout. Completion and settlement of the contract including resolution of all outstanding items.

Contracting Officer's Representative (COR). The individual designated in writing by the contracting officer to act as the contracting officer's authorized representative to monitor specific aspects of the contract and take action as authorized in the letter of appointment. The COR, when one is appointed, acts as the point of contact between the contracting officer and the COTR assigned to the contract. COR responsibilities and limitations are established by the contracting officer. [FAR Part 90.602-3, 31 Mar 1995]

Contracting Officer's Technical Representative (COTR). The individual designated by the contracting officer to act as the contracting officer's authorized representative for technical aspects of the contract. The COTR reports to and assists the COR, when one is appointed, in providing technical oversight of the contractors performance. COTR responsibilities and limitations are established by the contracting officer. In the event that a COR is not designated and only a COTR is appointed, the COTR shall report directly to the contracting officer. [FAR Part 90.602-3, 31 Mar 1995]

Contractor. An individual, partnership, company, corporation, or association having a contract with a contracting agency (Federal Government) for the design, development, maintenance, modification, or supply of configuration items and services under the terms of a contract.

Control Account. A management control point at which budgets (resource plans) and actual costs are accumulated and compared to earned value for management control purposes. A control account is a natural management point for planning and control since it represents the work assigned to one responsible organizational element on one work breakdown structure element.

Cost Estimate. A documented statement of costs estimated to be incurred to complete the project or a defined portion of a project. Cost-Plus-Award Fee (CPAF). This is a cost-reimbursement contract that provides a fee consisting of (1) A base fee fixed at inception of the contract and (2) an award fee, based upon a periodic judgmental evaluation by the government. The fee should be sufficient enough to provide motivation for excellence in such areas as quality, timeliness, technical ingenuity and cost-effective management during contract performance. The contractor may earn the award amount in whole or part. The amount of the award fee is made unilaterally by the government. CPAF contracts have widely been used to contract for services. A major feature of this type of contract is that they require the government regular evaluations of their performances usually every 3 to 6 months.

Cost-Plus-Fixed Fee (CPFF). This is a cost-reimbursement contract that provides for payment to the contractor of a negotiated fee (profit) that is fixed at the inception of the contract. This fixed fee does not vary with actual cost but may be adjusted as a result of changes in the work to be performed under the contract. A CPFF contract permits contracting efforts that might otherwise present too great a risk to contractors, but it gives the contractor less incentive to control costs than does a fixed-price contract. There are two forms of CPFF contracts:

1. the completion form, in which the work is described by stating a definite goal or target and an end product (a report), and

2. the term form, in which the contract calls for a stated level of effort (usually hours or days of specified classes of labor) over a given period of time.

Cost-Plus-Incentive Fee (CPIF). This is a cost-reimbursement contract that provides for the initially negotiated target fee to be adjusted later by a formula based on the relationship of total allowable costs to total target costs. A CPIF contract specifies a target cost, a target fee, a minimum fee, a maximum fee and a fee adjustment formula. After contract performance, the fee payable to the contractor is determined in accordance with the formula. To encourage the contractor to manage the contract effectively, the formula provides for increases in fee above target fee when total allowable costs are less than target costs, and decreases in fee below target fee when total allowable costs exceed target costs. When the total allowable cost is greater or less than the range of costs within which the fee adjustment formula operates, the contractor is paid total allowable costs plus the minimum or maximum fee.

Cost Variance. It is the algebraic difference between earned value and actual cost (Cost Variance = Earned Value - Actual Cost.) A positive value indicated a favorable position and a negative value indicates an unfavorable condition.

Costs to Date. Costs incurred to date by the contractor and reported to DOE, which are recorded as accrued costs. They represent all charges incurred for goods and services received and other assets required, regardless of whether payment for the charges has been made. This includes all completed work and work in process chargeable to the contract. Accrued costs include invoices for (1) completed work to which the prime contractor has acquired title; (2) materials delivered to which the prime contractor has acquired title; (3) services rendered; (4) costs billed under cost reimbursement, or time and material subcontracts for work to which the prime contractor has acquired title; (5) progress payments to subcontractors that have been paid or approved for current payment in the ordinary course of business (as specified in the prime contract); and (6) fee profit allocable to the contract.

Critical Decision (CD). A formal determination made by the AE and/or designated official (Mission Need Statement) at a specific point in a project life cycle that allows the project to proceed. Critical Decisions occur in the course of a project. For example. prior to commencement of conceptual design, commencement of execution and prior to turnover.

Critical Path. In a project network diagram, the series of logically linked activities that determine the earliest completion date for the project. The critical path may change from time to time as activities are completed ahead of or behind schedule. Although normally calculated for the entire project, the critical path can also be determined for a milestone or subproject. The critical path is usually defined as those activities with float less than or equal to a specified value, often zero.

Critical Path Method. A network analysis technique used to predict project duration by analyzing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date to result in zero total float for each activity.

Deactivation. The process of placing a facility in a stable and known condition including the removal of readily removable hazardous and radioactive materials to ensure adequate protection of the worker, public health and safety, and the environment, thereby limiting the long-term cost of surveillance and maintenance. Actions include the removal of fuel, draining and/or de-energizing nonessential systems, removal of stored radioactive and hazardous materials, and related actions. Deactivation can also include disposition of wastes generated during deactivation efforts. Deactivation does not include all decontamination necessary for the dismantlement and demolition phase of decommissioning, e.g., removal of contamination remaining in the fixed structures and equipment after deactivation.

Decommissioning. The process of closing and securing a nuclear facility or nuclear materials storage facility so as to provide adequate protection from radiation exposure and to isolate radioactive contamination from the human environment.

Decontamination. The removal of a chemical, biological, or radiological contaminant from, or neutralizing its potential effect on, a person, object or environment by washing, chemical action, mechanical cleaning, or other techniques. Deactivation may also include treatment and disposal of wastes generated during decontamination efforts.

Directed Change. A change imposed on a project(s) that affects the project's baseline. Example of directed changes include, but are not limited to. (a) Changes to approved budgets, or funding, and (b) changes resulting from DOE policy directives and regulatory or statutory requirements.

Disposition. A general term for those activities that follow completion of program mission, including, but not limited to, stabilization, deactivation, decontamination, decommissioning, dismantlement, and/or reuse of physical assets. It is used as a general term for those project types that follow mission completed.

Duration. The number of work periods (not including holidays or other non-working periods) required to complete an activity or other project element. Usually expressed as workdays or workweeks. Sometimes incorrectly equated with elapsed time.

Earned Value (EV). (1) A method for measuring project performance. It compares the value of work performed (Budgeted Cost of Work Performed) with the value of work scheduled (Budgeted Cost of Work Scheduled) and the cost of performing the work (Actual Cost of Work Performed) for the reporting period and/or cumulative to date. See also ACTUAL COST OF WORK PERFORMED, BUDGETED COST OF WORK SCHEDULED, BUDGETED COST FOR WORK PERFORMED, COST VARIANCE, COST PERFORMANCE INDEX, SCHEDULE VARIANCE, AND SCHEDULE PERFORMANCE INDEX. (2) The budgeted cost of work performed for an activity or group of activities.

End Item. The product/deliverable of a specific type of procurement action. To qualify as an end item, the procurement action product or deliverable is to be a stand-alone unit that meets all requirements and performs its intended function/mission without any additional components, infrastructure support or supporting assemblies. For example, a fire truck, a mobile crane, an earthmover.

Engineering Change. An approved change to controlled identification documentation. An engineering change proposal is used to recommend an engineering change. There are typically two classes of engineering changes. (a) Class 1. Changes of configuration, which affects Departmental interest and requires approval from the appropriate approval authority or designated representative. Class 1 engineering changes are those, which affect. (1) technical baseline requirements, and/or (2) non-technical contractual provisions such as fee, incentives, cost, schedule, guarantees, or deliveries. (b) Class 2. Changes to a product that do not affect any of the Class 1 engineering change requirements.

Estimate At Completion (EAC). The current estimated cost for program authorized work.

Estimate To Complete (ETC). Estimate of costs to complete all work from a point in time to the end of the project or program.

Estimated Cost. An anticipated cost for applied work scope.

Executability Review. Executability Reviews are organized and conducted for all projects. For Major Systems, the executability review is organized and conducted by OECM. For non-Major Systems, the review is to be organized and conducted by the program, using independent reviewers who are not assigned or working on the project at the contractor or field level.

Executability reviews assess the project and validate the plans as executable within the Performance Baseline.

Facilities. Buildings and other structures; their functional systems and equipment, including site development features such as landscaping, roads, walks, and parking areas; outside lighting and communications systems; central utility plants; utilities supply and distribution systems; and other physical plant features.

Final Design. Completion of the design effort and production of all the approved design documentation necessary to permit procurement. Construction, testing, checkout, and turnover to proceed. Final design occurs between Critical Decision-2 and -3.

Fixed Price Contract. Fixed price contracts provide for a firm price or, under appropriate circumstances, may provide for an adjustable price for the supplies or services that are being procured. In providing for an adjustable price, the contract may fix a ceiling price, target price (including target cost), or minimum price. Unless otherwise provided in the contract, any such ceiling, target, or minimum price is subject to adjustment only if required by the operation of any contract clause that provides for equitable adjustment, escalation, or other revision of the contract price upon the occurrence of an event or a contingency.

Fixed Price Incentive Fee Contract. A type of contract where the buyer pays the seller a set amount (as defined by the contract), and the seller can earn an additional amount if it meets or exceeds defined performance criteria.

General Plant Projects (GPP). Projects for maintaining infrastructure at a site that are less than $5 million.

Independent Cost Estimate (ICE). A "bottoms-up" documented, independent cost estimate that has the express purpose of serving as an analytical tool to validate, crosscheck, or analyze cost estimates developed by project proponents.

Independent Cost Review (ICR). An essential project management tool used to analyze and validate an estimate of project costs. An independent cost review is typically conducted on all projects at the point of baseline approval. Such reviews may be required by Congress, DOE management, Headquarters program offices, or field project management staff. The requiring office or agency will provide specific requirements for such reviews. An ICR may be performed by an independent internal or external organization.

Initial Operating Capability (IOC). The point at which a project is sufficiently complete and its performance has been demonstrated and it has met the technical threshold criteria in the Performance Baseline. It is not reaching full, steady state operations.

Integrated Project Team (IPT). An IPT is a cross-functional group of individuals organized for the specific purpose of delivering a project to an external or internal customer.

Integrated Safety Management (ISM). The application of the integrated safety management system (ISMS) to a project or activity. The fundamental premise of ISM is that accidents are preventable through early and close attention to safety, design, and operation, and with

substantial stakeholder involvement in teams that plan and execute the project, based on appropriate standards.

Integrated Safety Management System (ISMS). An overall management system designed to ensure that environmental protection; worker and public safety is appropriately addressed in the planning, design, and performance of any task.

Key Performance Parameters (KPP). A vital characteristic of a project or facility mission. A characteristic, function, requirement, or design basis, that if changed, would have a major impact on the facility or system performance, scope, schedule, cost and/or risk, or the ability of an interfacing project to meet its mission requirements. Thus, a KPP may be a performance, design or interface requirement. Parameters that are appropriate for KPPs are those that express performance in terms of accuracy, capacity, throughput, quantity, processing rate, purity, or others that define how well a system, facility or other project will perform.

Lead Program Secretarial Officer (LPSO). The individual assigned the responsibility for a specific site where the site supports multiple programs.

Level of Effort (LOE). Effort of a general or supportive nature usually without a deliverable end product. An activity (e.g., vendor or customer liaison) that does not readily lend itself to measurement of discrete accomplishment. It is generally characterized by a uniform rate of activity over a specific period of time. Value is earned at the rate that the effort is being expended.

Life-Cycle Cost (LCC). The sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a major system over its anticipated useful life span. Where system or project planning anticipates use of existing sites or facilities, restoration, and refurbishment costs should be included.

Line Item. An appropriation by Congress for a specific effort, activity or project. All budget is appropriated by Congress through line items.

Long-Lead Procurement. Equipment or material that must be procured in well in advance of the need for the materials because of long delivery times.

Major System (MS). A project with a Total Project Cost of greater than $400 million or designated by the Deputy Secretary.

Management Reserve An amount of the total allocated budget withheld for management control purposes by the contractor. Management Reserve is not part of the Performance Measurement Baseline.

Master Schedule. A summary-level schedule that identifies the major activities and key milestones. See also Milestone Schedule.

Milestone Schedule. A summary-level schedule that identifies the major milestones. See also MASTER SCHEDULE.

Milestone. A schedule event marking the due date for accomplishment of a specified effort (work scope) or objective. A milestone may mark the start, an interim step, or the end of one or more activities.

Mission Need. A performance gap between current performance and required

Monte Carlo Analysis. The Monte Carlo method provides approximate solutions to a variety of mathematical problems by performing statistical sampling experiments on a computer. The method applies to problems with no probabilistic content as well as to those with inherent probabilistic structure. The Monte Carlo method is used in risk analysis and other areas requiring quantification.

Network Schedule. A schedule format in which the activities and milestones are represented along with the interdependencies between activities. It expresses the logic (how the program will be accomplished) and the timeframes (when). Network schedules are the basis for critical path analysis, a method for identification and assessment of schedule priorities and impacts.

Organizational Breakdown Structure (OBS). A depiction of the project organization arranged to indicate the line reporting relationships within the project context.

Other Project Costs (OPC). Costs for engineering, design, development, startup, and operations, which are essential for project execution and are Operating Expense funds.

Non-Major System. Any project with a Total Project Cost less than $400 million.

Parametric Estimating. An estimating technique that uses a statistical relationship between historical data and other variables (e.g., square footage in construction, lines of code in software development) to calculate an estimate.

Planning Package. A logical aggregate of work, usually future efforts that can be identified and budgeted, but which is not yet planned in detail at the work package or task level.

Program. An organized set of activities directed toward a common purpose or goal undertaken or proposed in support of an assigned mission area.

Program Manager. An official who has been assigned responsibility for accomplishing a specifically designated unit of work effort, or group of closely related efforts, established to achieve stated or designated objectives, defined tasks, or other units of related effort on a schedule, funded as part of the project. The Program Manager is responsible for the planning, controlling, and reporting of the project, and for the management of a specific function or functions, budget formulation, and execution of the approved budget. The Program Manager receives an approved funding program from the Office of the Controller identifying program dollars available to accomplish the assigned function.

Program Office. The Headquarters organizational element responsible for managing a program.

Program Secretarial Officer (PSO). A senior outlay program official which includes the Senior Outlay program official which includes the Assistant Secretaries, or Office Directors at the Assistant Secretary level, and/or the Assistant Administrators for NNSA.

Project. In general, a unique effort that supports a program mission, having defined start and end points, undertaken to create a product, facility, or system, and containing interdependent activities planned to meet a common objective or mission. A project is a basic building block in relation to a program that is individually planned, approved, and managed. A project is not constrained to any specific element of the budget structure (e.g., operating expense or plant and capital equipment). Construction, if required, is part of the total project. Authorized, and at least partially appropriated, projects will be divided into two categories. major system projects and other projects. Projects include planning and execution of construction, renovation, modification, environmental restoration, decontamination and decommissioning efforts, and large capital equipment or technology development activities. Tasks that do not include the above elements, such as basic research, grants, ordinary repairs, maintenance of facilities, and operations are not considered projects.

Project Data Sheet (PDS). A generic term defining the document that contains summary project data and the justification required to include the entire project effort as a part of the Departmental budget. PDSs are submitted to request PED funds, and construction funds. Specific instructions on the format and content of PDSs are contained in the annual budget call, and DOE O 5100.3, Field Budget Process.

Design Criteria. Those technical data and other project information identified during the project initiation and definition (conceptual design, and/or preliminary design phases). They define the project scope, construction features and requirements, and design parameters; applicable design codes, standards, and regulations; applicable health, safety, fire protection, safeguards, security, energy conservation, and quality assurance requirements; and other requirements. The project design criteria are normally consolidated into a document, which provides the technical base for any further design performed after the criteria are developed.

Project Engineering and Design (PED). Design funds established for use on preliminary design, which are Operating Expense funds.

Project Execution Plan (PEP). The plan for the execution of the project, which establishes roles and responsibilities and defines how the project will be executed.

Real Property. Land and/or improvements including interests therein, except public domain land.

Remaining Duration. The time needed to complete an activity.

Resource Leveling. Any form of network analysis in which scheduling decisions (start and finish dates) are driven by resource management concerns (e.g., limited resource availability or difficult-to-manage changes in resource levels).

Resource-Limited Schedule. Schedules whose start and finish dates reflect expected resource availability. The final project schedule should always be resource-limited.

Responsibility Assignment Matrix (RAM). A structure that relates the project organization structure to the work breakdown structure to help ensure that each element of the project's scope of work is assigned to a responsible individual.

Risk. A measure of the potential inability to achieve overall project objectives within defined cost, schedule, and technical constraints and has two components. (1) the *probability/likelihood* of failing to achieve a particular outcome, and (2) the c*onsequences/impacts* of failing to achieve that outcome.

Risk Event. A discrete occurrence that may impact a e.

Risk Management. The act or practice of controlling risk. An organized process that reduces risk, prevents a risk from happening, or mitigates the impact if it does occur.

Schedule. A plan that defines when specified work is to be done to accomplish program objectives on time.

Schedule Control. Controlling changes to the project schedule and preparing workaround plans to mitigate the impact of adverse results/delays by others.

Schedule Variance (SV). A metric for the schedule performance on a program. It is the algebraic difference between earned value and the budget (Schedule Variance = Earned Value - Budget). A positive value is a favorable condition while a negative value is favorable. The SV is calculated in dollars or work units and is intended to compliment network analysis, not supercede or replace it.

System. A collection of interdependent equipment and procedures assembled and integrated to perform a well-defined purpose. It is an assembly of procedures, processes, methods, routines, or techniques united by some form of regulated interaction to form an organized whole.

Total Estimated Costs (TEC). The Total Estimated Cost of a project is the specific cost of the project, whether funded as an operating expense or construction. It includes the cost of land and land rights; engineering, design, and inspection costs; direct and indirect construction costs; and the cost of initial equipment necessary to place the plant or installation in operation, whether funded as an operating expense or construction.

Total Project Cost (TPC). Total cost for the project including all cost regardless of sources or type of funds.

Undistributed Budget (UB). Budget associated with specific work scope or contract changes that have not been assigned to a control account or summary-level planning package.

User. The entity that ultimately will operate or otherwise use the system being developed. When the project objective is to demonstrate to the private sector the utility or feasibility of a given system for commercial application, the identity of the ultimate user may not be known. In such case, only the most likely type of user (utility, constructor, energy supplier) may be identifiable.

Validation. The process of evaluating project planning, development, baselines and proposed funding prior to inclusion of new project or system acquisition in the DOE budget

Value Management (VM). Value management is organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving

the essential functions at the lowest life-cycle cost consistent with required performance, quality, reliability and safety.

Work Breakdown Structure (WBS). A product-oriented grouping of project elements that organizes and defines the total scope of the project. The WBS is a multi-level framework that organizes and graphically displays elements representing work to be accomplished in logical relationships. Each descending level represents an increasingly detailed definition of a project component. Project components may be products or services. It is the structure and code that integrates and relates all project work (technical, schedule, and cost) and is used throughout the life cycle of a project to identify and track specific work scopes.

Work Breakdown Structure Dictionary. A listing of work breakdown structure elements with a short description of the work scope content in each element.

Work Package. A task or set of tasks performed within a control account.

Workaround. A response to a specific negative schedule event. Distinguished from a contingency plan in that a workaround is not planned in advance of the occurrence of the risk event.