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Risk Management Guide
DOE G 413.3-7A

Project Management Programs

December 2022

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Project Management Document Hierarchy

Federal/National Level Policy/ Guidance

- **OMB Circular A-11: Part 7**
  Capital Programming Guide: References EIA-748 for EVMS Requirements
- **FAR Part 34: Major System Acquisition**
  General Describes Acquisition Policy and Procedures to OMB Circular A-109 and OMB A-11
- **FAR Part 34.2: Earned Value Management System**
  Describes policies and procedures for EVMS in major acquisitions defined in OMB A-11, Part 7
- **FAR Part 52.234-4: Earned Value Management System**
  Establishes compliance the Earned Value requirements of EIA-748
- **SAE International EIA 748™**
  Earned Value Management System

Agency/DOE Policy/Guidance

- **DOE EM Program Management Protocol**
- **DOE-PM-SOP- Current Version**
  PM EVMS ECRSOP Compliance Assessment Guide
- **DOE 413.3B Current Version**
  Program and Project Management for the Acquisition of Capital Assets
- **DOE 413.3-1**
  Managing Design and Construction Using Systems Engineering
- **DOE 413.3-5A**
  Performance Baseline
- **DOE 413.3-7A**
  Risk Management
- **DOE G 413.3.9A**
  Project Reviews for Capital Asset Projects
- **DOE 413.3-10.B**
  Integrated Project Management Using the EVMS
- **DOE 413.3-12**
  Project Definition Rating Index
- **DOE 413.3-15A**
  Project Execution Plans
- **DOE 413.3-18A**
  Integrated Project Team Guide for formation and implementation
- **DOE 413.3-20**
  Change Control Management
- **DOE 413.3-21A**
  Cost Estimating Guide

Field Office/TOC Contract/ Contractor Policy/Guidance

- **Tank Operations Contract - DE-AC27-08RV14800**
  Performance-Based Cost-Plus-Award Fee Contract
- **TFC-PLN-84**
  Tank Operations Contract Project Execution Management Plan
- **TFC-PLN-147**
  TOC Project Controls System Description
- **RPP-PLAN-62858**
  TOC Project Execution Plan for TSCR, Tank Farm Upgrades, and Waste Feed Delivery

Tank Operations Contract

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Forward

This Department of Energy (DOE) Guide is for use by all DOE elements. **This Guide intends to provide non-mandatory risk management approaches for implementing the requirements of DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets**, dated 11-29-2010. DOE programs may adopt other acceptable risk management approaches/methods as determined appropriate for the type of project and program maturity by the line management for the specific program. **This Guide does not impose, but may cite, requirements.** Guides neither substitute for requirements nor replace technical standards that implement requirements. Program-specific guidance takes precedence over this guide. Send citations of errors, omissions, ambiguities, and contradictions found in this guide to PMpolicy@hq.doe.gov.

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Purpose

The purpose of this guide is to describe effective risk management processes. The **continuous** and **iterative process** includes **updating project risk documents** and the **risk management plan** and **emphasizes implementation communication of the risks and actions taken**. The guidelines may be tailored according to program guidance and the needs of projects. DOE programs may adopt other acceptable risk management approaches/methods as determined appropriate for the type of project and program maturity by the line management for the specific program. A program (e.g., Office of Science) that has a methodology to adequately govern risk management may continue to use its own specific methodology.

This guide provides a suggested framework for identifying and managing key technical, schedule, and cost risks and how it integrates with the development and consistent use of government contingency and contractor management reserve. DOE Order 413.3B (the Order) states that risk management is an essential element of every project.

The definition of risk for this guide **is a factor, element, constraint,** or **course of action that introduces an uncertainty of outcome that could impact project objectives.**

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SCOPE

This guide may be used by all Department of Energy (DOE) offices and the National Nuclear Security Administration (NNSA), their respective field operations, operations' contractors, and subcontractors as specified in their respective contracts.

This guide suggests processes for the initiation, planning, execution, monitoring, and close-out of the risk management throughout the life cycle of the project. As such, the concepts and practices in this guide may be tailored based upon:

- project complexity
- size and duration of the project.
- initial overall risk determination of the project.
- organizational risk procedures.
- available personnel and their skills levels for performing risk management.
- available relevant data and its validation.

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The final determination for risk management tailoring should be with the Integrated Project Team (IPT) or the Contractor Project Manager (CPM) as described in the project risk management plan. **Tailoring** of the risk management process **generally includes** selection of **what risks to actively manage based on risk level**, **determination whether to perform a quantitative analysis**, **types of analysis to be performed,** communication plan requirements, and **types and frequency of reporting and monitoring.**

This guidance and advice should be intended to meet, but should not be limited to, the following objectives to identify :

- risk management **processes**.
- steps necessary to facilitate the **implementation of those processes.**
- **life-cycle risk management guidance**.
- risk management **documentation** guidance.
- risk management **monitoring and reporting** guidance.

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RISK MANAGEMENT ORGANIZATIONAL BREAKDOWN STRUCTURE, CONCEPT, AND RESPONSIBILITIES

Risk Management Organizational Breakdown Structure

Using the organizational breakdown structure (OBS) in the Project Execution Plan (PEP) or Project Management Plan (PMP), **the risk management team should be identified along with roles and responsibilities of the team members.** Whenever the PEP or PMP is updated, the risk management plan should also be updated, if changes have been made to the OBS.

The organizational breakdown structure **should serve three purposes in risk management**.

- Highlights the **chain of authority**, **communication structure**, and **management framework** with which risk management and the decision processes will occur.
  - Assists with **identifying organizational risks and/or external risks**.
  - Assists with **identifying where certain risk management ownership and decision processes reside.**
  - **Reduces time for critical risk communication**.
  - Allows for **documentation of risk communication chain.**

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- Provides **a means to map risks organizationally** to **determine where the greatest number of risks resides and/or the highest-rated risks reside**.
  - Can **provide a format for the development of a Risk Breakdown Structure** (see Attachment 1, Risk Breakdown Structure).
  - Provides **a means of identifying risk owners**.

The **risk management organizational structure assists in integrating risk management into the procedures and processes of the organization**. It also assists in **developing the responsibility assignment matrix for key risk management roles and responsibilities** in a structured and formal manner and facilitates the communication process suggested in this guide. It provides **a means to link the risk breakdown structure with the organization for risk management to determine where the risks reside and who is responsible for them**.

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Risk Management Organizational Concept

Programs and projects are of varied types and of differing complexity. The risks may span multiple levels of organizational management, crosscut multiple organizations, and/or crosscut different sites within the complex. **For risk management to be effective, it should be an integral part of the organization's corporate enterprises-governance (e.g., standards, procedures, directives, policies, and other management documentation).**

The **processes and procedures**, along with applicable tools **to be used for performing risk management functions should be carefully considered**, **established**, and **well defined when implemented.**

The risk management processes described later **in this guide should be carefully tailored to involve and meet the needs of the organization's internal planning**, assessment, project controls, risk monitoring, reporting, and decision-making processes at the different levels of risk management.

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A clearly defined integrated risk management framework should consider the structure and interactions of the management organization(s) and management levels. These should be charted or mapped out and institutionalized (process-wise) in order to help:

- **Align the organization(s) to accomplish the mission**, in concert with the established requirements, policies, strategic plans, roles and responsibilities aligned via clearly defined and well-understood processes and procedures. This alignment should be done in order to meet the goals and objectives of the Department at all levels of the organization(s) **supported by risk management-based decision making knowledge**.
- **Increase the interaction and communication between upper management and functional contributors**, and to better understand all types of project risks, such as: political, economic, social, and technological, policy, program, project, financial, resource-based, climate change and extreme weather, health and safety, safeguards and security, and operational. **Without this interaction**, identification of risks and the communication and **handling of risks cannot be adequately accomplished or be well understood**.

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- **<u>Apply a consistent integrated systematic risk management process approach at all levels of risk management to support decision-making</u>** and encourage better understanding and application of the risk management process. For example, the same risk can exist in different organizational levels such as the contractor, the site DOE Offices, and Program Headquarters (HQ) Offices. This risk may be shared by all the organizations and may be managed by all utilizing different perspectives. This risk can also be within the same site and crosscut and affect other capital, cleanup, information technology, or operating projects, etc.
- **<u>Build a culture that fosters risk management related learning</u>**, innovation, due diligence, responsible leadership, management participation and involvement, lessons learned, continuous improvement, and successive knowledge transfer.
- The risk management framework should be completely integrated into the procedures and processes of the organization. The **<u>risk management processes and procedures should be supported by management through self-assessments, lessons learned, and a continuous improvement environment</u>**.

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Risk Management Organizational Responsibilities

The key roles, roles which have a significant impact upon the risk management of the project, and responsibilities are the highest level of project risk authority and responsibility. **A complete responsibility assignment matrix for risk management roles and responsibilities should be included in the risk management plan**.

Federal Project Director

As per DOE O 413.3B, the Federal Project Director (FPD) is **responsible for leading the IPT**. **Throughout the project life cycle**, the FPD should:

- Apply a **continuous**, **iterative risk management process**.
- **Document and manage risks**.
- **Develop, maintain, and provide required risk documentation**, and report to appropriate project and program management personnel. This includes providing configuration management for this documentation.
- **Ensure a tailored approach to risk management**.
- **Ensure that the sponsoring program office continues to be informed of the status of project risks** with potentially large cost and schedule impacts as soon as they are recognized.
- **Formally accept or reject any risks** that are **proposed to be transferred from the contractor to the federal government** (DOE or NNSA).
- **Oversee acceptance and closure of risks owned by the FPD.**

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- **Oversee the roles and responsibilities of each IPT member** with respect to risk management.
- **Coordinate with the project's Contracting Officer** early in the acquisition process and throughout the project for contract-related risks.
- **Serve as the focal point of communication** between the contractor and DOE-HQ for all risk-related issues.
- **Develop an environment in which lessons learned are encouraged** from project experience and risk management, and develop new lessons learned as appropriate.

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Integrated Project Team

Throughout the project life cycle, the IPT, in support of the FPD, should:

- Apply the continuous risk management process.
- Document and manage the risk management process contained within the risk management plan and the risk management communication plan (see Section 5.3, Risk Management Communication Plan).
- Provide documentation and management of risks throughout the project life cycle via the project risk register (see Section 4.3.5, Risk Register, and Attachment 1, Risk Breakdown Structure).
- Develop and provide the project risk status report (see Attachment 2, Risk Status Report) to management.

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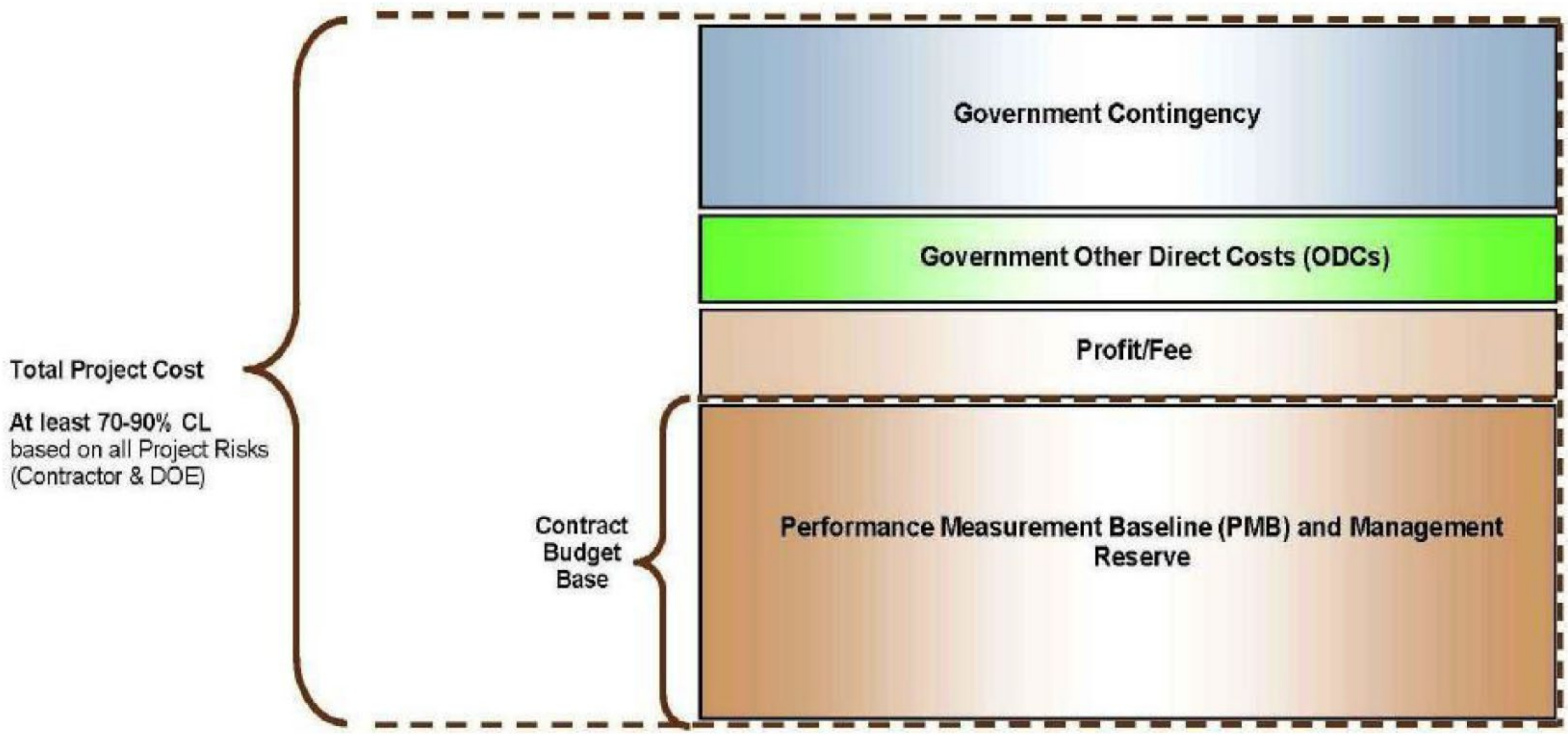
Contractor Project Manager (CPM)

The CPM manages risks under the Contract Budget Base (see Attachment 11, Figure A-1) **independently subject to the requirements set in the procurement contract.** The risk management responsibilities of the CPM, unless otherwise directed by the contract terms and conditions **as they bound the project life cycle, should be to:** (see Section 7 and Attachments 11-14 for a discussion on contractor's risks and their management under the Contract Budget Base)



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- **Apply a continuous, iterative risk management** process for all contractor risks.
- **Document and manage contractor risks** and transfer to the Government, with FPD concurrence, risks that are not the contractor's responsibility.
- **Develop, maintain, and provide required risk documentation** (using configuration management) and reporting to appropriate project and program management personnel. This includes providing configuration management for this documentation.
- **Ensure the project's Contracting Officer continues to be informed** of the change control process and that the supporting documentation is generated for managing risks within the Contract Budget Base.
- **Coordinate with the FPD** in the development of a tailored approach to overall project risk management.
- **Coordinate** with the FPD in the process of **recognition, acceptance and closure of key project risks.**

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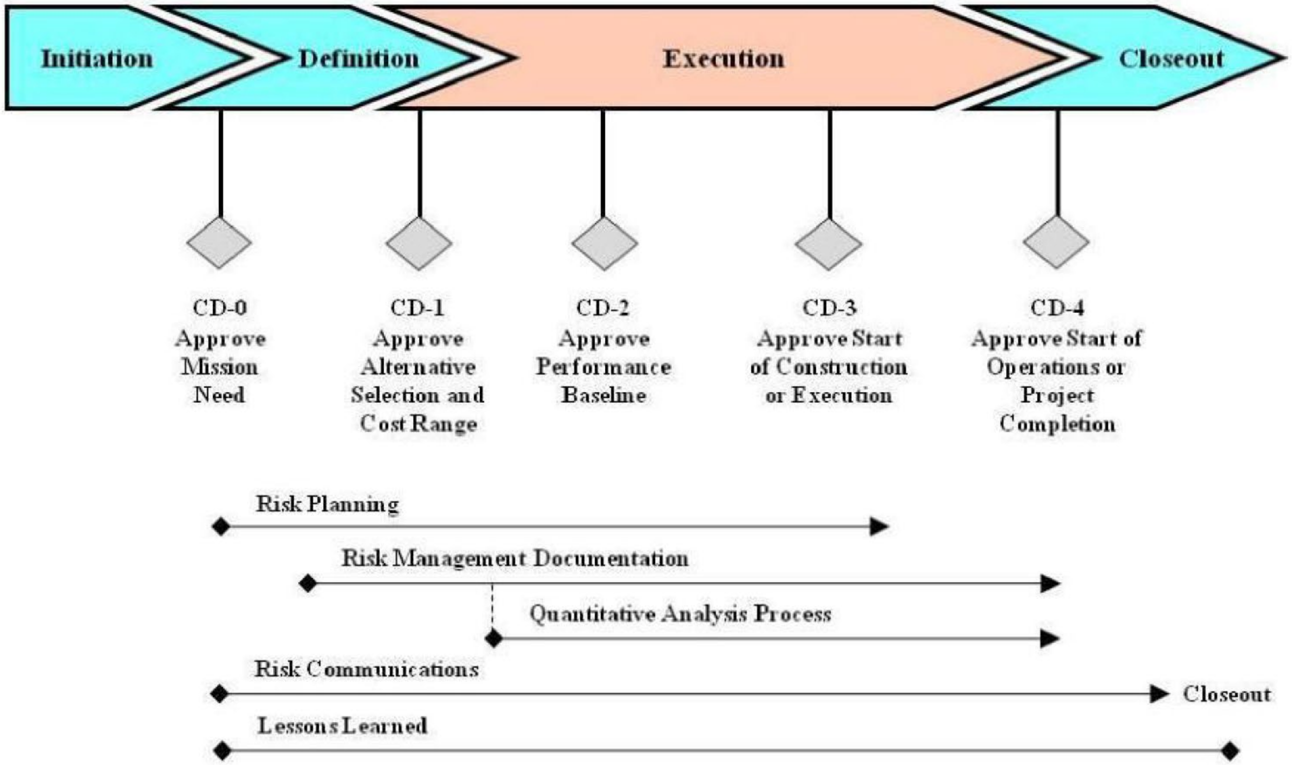
RISK MANAGEMENT PROCESS WITHIN THE PROJECT LIFE CYCLE

Project Phase Integration

This risk management guide is integrated with DOE O 413.3B, but it also suggests process steps beyond those stated in DOE O 413.3B in some specific instances, **such as the Risk Register**. The risk management process is a continuous, iterative process that is performed as early in the project life cycle as possible.



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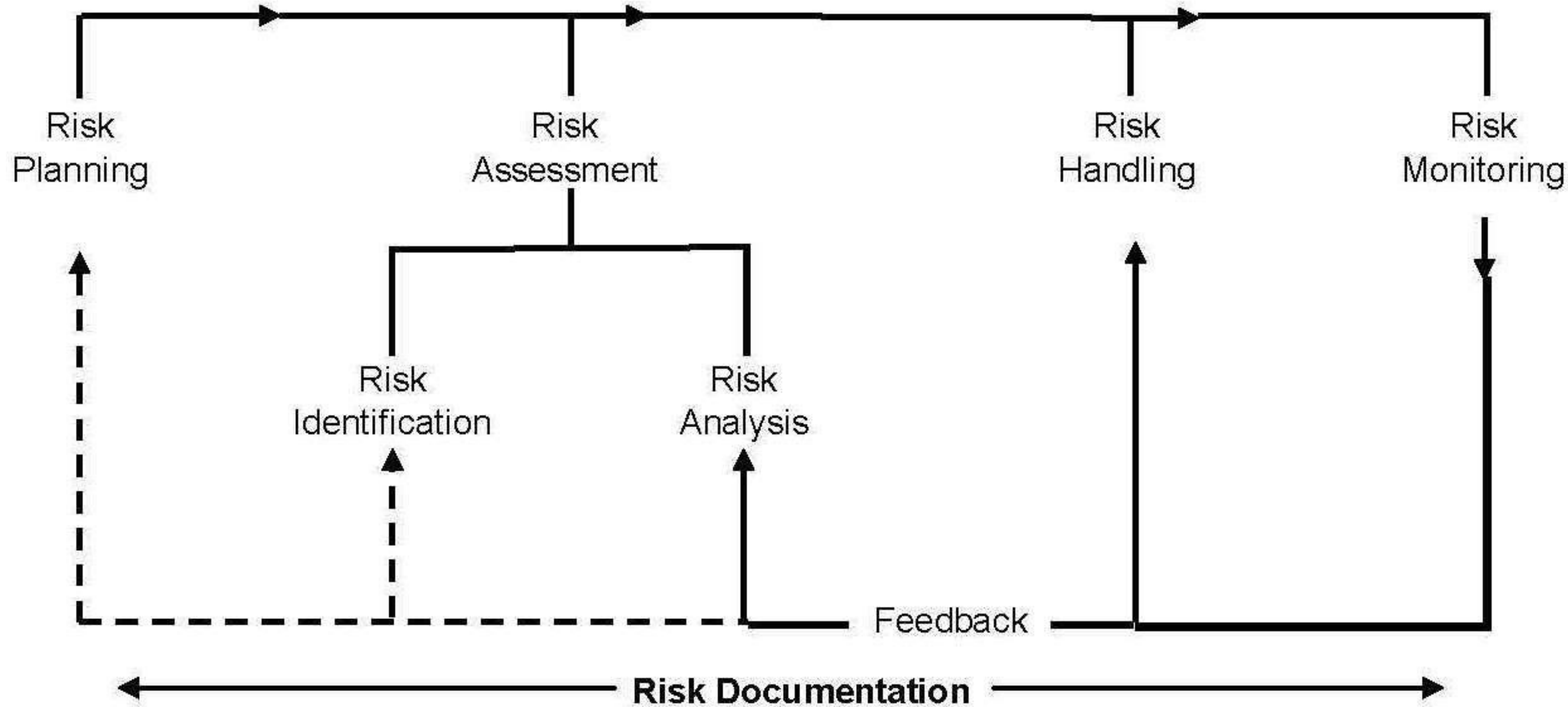
<u>Wherever possible, the project phases in DOE O 413.3B should be aligned with the risk management process</u> to allow an integrated view. While this view presents a static view of risk management, it is not meant to infer that the process is static. Instead, it is meant to demonstrate when one should initiate certain process steps for the first time. Risk Management Process…Linear **<u>Representation of the Continuous and Iterative Process</u>**

<u>The risk management plan should be included in or referenced in the preliminary project execution plan during CD-1</u>



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Risk Planning

The risk planning process should begin as early in the project life cycle as possible. Planning sets the stage and tone for risk management and involves many critical initial decisions that should be documented and organized for interactive strategy development.

Risk planning is conducted by the IPT (if assembled by this time) and a FPD or an assigned lead federal employee if the FPD is not yet assigned. **Risk planning should establish methods to manage risks**, including metrics and other mechanisms or determining and documenting modifications to those metrics and mechanisms. **A communication structure should be developed** to **determine whether a formal risk management communication plan should be written and executed** as part of the tailoring decisions to be made in regard to the project. Input to the **risk planning** process **includes** the project **objectives**, **assumptions**, **mission need statement**, **customer/stakeholder expectations**, and **site office risk management policies** and practices.

The team should also establish what resources, both human and material, would be required for successful risk management on the project. Further, an initial reporting structure and documentation format should also be established for the project.

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Overall objectives for risk planning should:

- Establish the overall risk nature of the project including **recognizing the relative importance of the project to the office with the DOE** or the NNSA (to include its priority ranking within the organization).
- Establish the **overall experience and project knowledge desired** of the IPT.
- Establish the **technical background and risk knowledge** desired of the IPT.

An initial responsibility assignment matrix with roles and responsibilities for various risk management tasks should be developed. Through this Responsibility Assignment Matrix, gaps in expertise should be identified and plans to acquire that expertise should be developed.

The result of the risk planning process is the Risk Management Plan. The Risk Management Plan (RMP) ties together all the components of risk management – i.e., risk identification, analysis, and mitigation – into a functional whole. The plan is an integral part of the project plan that informs all members of the project team and stakeholders how risk will be managed, and who will manage them throughout the life of the project. It should be part of the initial project approval package. **A companion to the RMP is a Risk Register which is updated continuously and used as a day-to-day guide by the project team.**

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Risk Responsibility Assignment Matrix

	Federal Project Director[1]	Integrated Project Team	Subject Matter Expert	Contractor Project Manager	Other—Identify[2]
Risk Planning					
Risk Identification					
Qualitative Analysis					
Quantitative Analysis					
Handling Response					
Monitoring and Control					
Risk Communication					

Legend					
Responsible	Accountable	Reviews	Approves	Contributes	Prepares

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Risk Assessment

<u>Risk assessment includes the overall processes of risk identification and analysis.</u> The **<u>risk assessment process identifies, analyzes</u>**, and **<u>quantifies</u>** potential program and project risks in terms of **<u>probability and consequences</u>**. Risk analysis is a technical and systematic process that is designed to:

- examine risks,
- identify assumptions regarding those risks,
- identify potential causes for those risks, and
- determine any relationships to other identified risks, as well as stating the overall risk factor in terms of the probability and consequence, if the risk should occur.
- Risk identification and analysis are performed sequentially with identification being the first step

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Risk Identification

As with each step in the risk management process, **risk identification should be done continuously throughout the project life cycle**. As projects change - particularly in terms of budget, schedule, or scope - or when a mandatory review or update is required, the risk identification process should be iterated, at least in part. **Post CD-1, the Risk Register should be evaluated at least quarterly.**

To begin risk identification, break the project elements into a risk breakdown structure that is the hierarchical structuring of risks. The risk breakdown structure is a structured and organized method to present the project risks and to allow for an understanding of those risks in one or more hierarchical manners to demonstrate the most likely source of the risk. **The risk breakdown structure provides an organized list of risks that represents a coherent portrayal of project risk and lends itself to a broader risk analysis.** The upper levels of the structure can be set to project, technical, external, and internal risks; the second tier can be set to cost, schedule, and scope. Each tier can be broken down further as it makes sense for the project and lends itself to the next step of risk analysis. **To be useful, the risk breakdown structure should have at least three tiers.**

Whenever using the Risk Breakdown Structure, it is important to remember to **consider the use of a category called "other."** This category will promote further brainstorming during the process and provide another opportunity for risk identification.

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The risk breakdown structure can be used to inform the following:

Updates of the risk management plan.	Safeguards and security analysis assumptions.
Work breakdown structure.	Requirements documents or databases.
Cost estimates.	Subject matter expert interviews.
Key planning assumptions.	Stakeholder input.
Preliminary schedules.	Designs or specifications.
Acquisition strategy documents.	Historical records.
Technology Readiness Assessment (TRA) information.	Lessons learned.
Project Definition Rating Index (PDRI) analyses.	Any legislative language pertaining to the project.
EM Project Critical Decision Assessment Tool (CDAT) analyses.	Other similar projects.
Safety-in Design considerations per DOE-STD-1189-2016.	Pertinent published materials.
Safety analysis assumptions.	Environmental considerations such as seismic, climate change and extreme weather (e.g., wind and flooding).

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Various techniques that can be used to elicit risks include brainstorming, interviews. and diagram techniques. **<u>Regardless of the technique, the result should not be limiting</u>** and should involve the greatest number of knowledgeable participants that can be accommodated within their constraints. In addition, the **<u>participants need to address risks that affect the project but are outside of the project ability to control</u>**. Examples include:

Closure of Waste Isolation Pilot Plant.	Stakeholder changes.
National repository not ready.	Site mission changes.
Congressional funding reductions.	Regulatory and Statutory changes.
DOE funding reductions.	DOE directives.
Re-programming.	

Once the process of initial risk identification is completed, the IPT should follow up with the self-assessment process

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<u>As the team identifies risks, it is important that they are aware of biases that may influence the information</u>. Typical biases the facilitator of the risk identification should be aware of include the following:

- **<u>Status quo</u>**—strong bias toward risks already identified.
- **<u>Confirming evidence bias</u>**—information that supports existing points of view are championed while avoiding information that contradicts.
- **<u>Anchoring</u>**—disproportionate weight is given to the first information provided.
- **<u>Sunk cost</u>**—tend to make choices in a way that justify past choices, unwillingness to change direction.

When identifying a risk, it should be stated clearly in terms of both the risk event and the consequences to the project. The format for the **<u>risk identified should generally be cause / risk / effect.</u>**

One may **<u>choose to record cause, risk, and effect in separate fields to facilitate grouping of risks</u>** into categories based on commonality of these attributes.

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This format should be employed whether the risk is a threat to the project or an opportunity, which is a risk with a benefit. Documentation should be done in affirmative terms - as if the risk will occur - to enable the IPT to draft a definitive risk handling strategy. The **information should be captured in a risk register to facilitate tracking and reporting.**

Examples of risks captured in the affirmative are:

- **Discovery of classified material in landfill delays** removal of transuranic material and impacts schedule resulting in higher than expected project costs.
- **Delay in signing a cooperative research and development agreement impacts** availability of specialized research personnel in statistical analysis of nano-scale stress data of carbon-based metals, delaying project by one year resulting in higher than expected project costs.
- **Seismic site analysis area is expanded due to adjacent construction** site seismic reports, resulting in new drilling and reporting that delays site preparation by six months resulting in higher than expected project costs.
- **Project complexity and size limits the number of contractor proposals competing for the work**, project costs are based on a limited number of proposals for work, resulting in higher than expected project costs.

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Risks should be linked to activities or Work Breakdown Structure as much as possible. The linkage is important, especially **if the risk owner is different as the risk owners may need to coordinate** their efforts on the risk handling strategies.

The IPT should capture both opportunities and threats. Opportunities are often shared between and among projects. It should be noted that **opportunities for one participant could be detrimental to another**; therefore, they should be worked cooperatively. **Examples** of opportunities include:

- Available **human resources** with flexible scheduling **can be shared to the advantage of two or more projects.**
- A **crane is available at another site at a lower cost** than purchasing a new or a used one.
- Additional bench scale testing shows that the **process flowsheet can be simplified**.

In addition to identifying a risk in terms of the causal event and consequence, the **pertinent assumptions regarding that risk should be captured** in the risk register to aid in future reporting of the risk. These assumptions might include items such as, but not limited to, **interfaces among and between sites, projects, agencies**, and other entities; **dependencies on human resources, equipment, facilities, or other**; and historically known items that may impact the project either positively or negatively. The **assumptions should be kept current** and **should be validated** through various methods including documentation and subject matter experts.

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Assignment of the Risk Owner

Before assigning a qualitative assessment to the dimensions of a risk (probability and consequence), **a risk owner should be identified**. The risk owner is the team member responsible for managing a specific risk from risk identification to risk closeout and should ensure that effective handling responses or strategies are developed and implemented, and should file appropriate reports on the risk in a timely fashion. **The risk owner should also validate the qualitative and quantitative assessments assigned to their risk.** Finally, the risk owner should **ensure that risk assumptions are captured in the risk register** for future reference and assessment of the risk and to assist possible risk transfer in the future.

Any **action taken** in regard to a risk **should be validated with the risk owner before closure** on that action can be taken.

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Assignment of Probability and Consequence

Risk analysis has two dimensions—**probability and consequence**. Probability is the likelihood of an event occurring, expressed as a qualitative and/or quantitative metric. Consequence is the outcome of an event.

The outcome of an event may include cost and/or schedule impacts. The initial assessments should assume that no risk handling strategy has been developed

After the risk mitigation approach is identified and a decision made to implement the mitigation, the **mitigation cost becomes part of the line-item cost and not the contingency**.

Only the **remaining residual risk should be included in the risk register** and contingency analysis.

During the qualitative analysis, the probability and consequence **scales can be categorical**.

However, **it is often useful to assign quantitative metrics to the qualitative categories to help ensure consistent assignment of probabilities and consequences across a project .** This approach works well for probability and consequence.

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Assignment of Risk Trigger Metrics

A risk trigger metric is an event, occurrence or sequence of events that indicates that a risk may be about to occur, or the pre-step for the risk indicating that the risk will be initiated. **The risk trigger metric is assigned to the risk at the time the risk is identified and entered into the risk register.** The trigger metric is then assigned a date that would allow both the risk owner and the FPD to monitor the trigger. **The purpose of monitoring the trigger is to allow adequate preparation for the initiation of the risk handling strategy** and to verify that there is adequate cost and schedule to implement the risk handling strategy.

Risk Register

The risk register is the information repository for each identified risk. It provides **a common, uniform format to present the identified risks**. The level of risk detail may vary depending upon the complexity of the project and the overall risk level presented by the project as determined initially at the initiation phase of the project.

The fields stated here are those that should appear in the risk register, whether the risks presented are a threat or an opportunity. • Project title and code (denotes how the project is captured in the tracking system used by the site office and/or contractor).

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Risk Register Suggested Fields

Project title and code (denotes how the project is captured in the tracking system used by the site office and/or contractor).	Risk cause/effect.
Unique risk identifier (determined by the individual site).	Trigger event.
Risk statement (consider separate sub-fields to capture cause/risk/effect format to facilitate automated search capabilities on common causes of risks).	Handling strategy (type and step-wise approach with metrics, who has the action, planned dates, and actual completion dates). Include the probability of success for the risk handling strategy and consider probabilistic branching to account for the handling strategy failing.
Risk category (project, technical, internal, external, and any sub-category that may be deemed unique to the project such as safety or environment).	Success metric for overall handling strategy.
Risk owner.	Residual risks.
Risk assumptions.	Secondary risks.
Probability of risk occurrence and basis.	Status (open/closed) and basis.
Consequence of risk occurrence and basis.	

The risk register may also include back-up strategies for primary risks, risk handling strategies for residual and secondary risks, the dates of upcoming or previous risk reviews, and **a comment section for historical documentation, lessons learned, and subject matter experts' input.**

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Risk Analysis

Risk analysis should begin as early in the project life cycle as possible. The simplest analysis is a cost and benefit review, a type of qualitative review.

The qualitative approach involves listing the presumed overall range of costs over the presumed range of costs for projected benefits.

The result would be a high-level overall assessment of the risks on the project **After CD-1 approval, two forms of risk analysis may be performed: Qualitative and quantitative.**

These analyses serve as the foundation for continuing dialog about future risk realizations and the need **for the application of the contingency and management reserve**, which are subjects addressed in other DOE G 413.3-series guides that handle cost and contingency calculations.

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Qualitative Risk Analysis

<u>The purpose of qualitative risk analysis is to provide a comprehensive understanding of known risks for prioritization on the project</u>. Qualitative risk assessment calls for several risk characteristics to be estimated:

Assumptions.	Trigger metrics or conditions.
Risk probability.	Affected project elements.
Risk consequence.	Others, as appropriate.

<u>These items should be captured in the risk register.</u> The initial qualitative assessment is done without considering any mitigation of the risk, that is, prior to the implementation of a handling strategy.

<u>Qualitative analysis</u>, or assessment as it is sometimes referred, **<u>is the attempt to adequately characterize risk</u>** in words **<u>to enable the development of an appropriate risk handling strategy.</u>** Additionally, qualitative analysis assigns a risk rating to each risk, which allows for a risk grouping process to occur. This **<u>grouping of risks may identify patterns of risk on the project</u>**. The patterns are indicative of the areas of risk exposure on the project. The qualitative analysis may be the foundation for initiating the quantitative risk analysis, if required.

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Qualitative Matrices Analysis

One of the tools used to assign risk ratings is a qualitative risk analysis matrix, also referred to as a probability impact diagram or matrix Qualitative Risk Analysis Matrix.

Probability / Consequence	Negligible	Marginal	Significant	Critical	Crisis
Cost	Minimal or no consequence. No impact to Project cost.	Small increase in meeting objectives. Marginally increases costs.	Significant degradation in meeting objectives significantly increases cost; fee is at risk.	Goals and objectives are not achievable. Additional funding may be required; loss of fee and/or fines and penalties imposed.	Project stopped. Funding withdrawal; withdrawal of scope, or severe contractor cost performance issues.
Schedule	Minimal or no consequence. No impact to Project schedule.	Small increase in meeting objectives. Marginally impacts schedule.	Significant degradation in meeting objectives, significantly impacts schedule.	Goals and objectives are not achievable. Additional time may need to be allocated. Missed incentivized and/or regulatory milestones.	Project stopped. Withdrawal of scope or severe contractor schedule performance issues.
Very High >90%	Low	Moderate	High	High	High
High 75% to 90%	Low	Moderate	Moderate	High	High
Moderate 26% to 74%	Low	Low	Moderate	Moderate	High
Low 10% to 25%	Low	Low	Low	Moderate	Moderate
Very Low <10%	Low	Low	Low	Low	Moderate

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Risk ratings are also often referred to as risk impact scores.

The matrix combines the probability and consequence of a risk to identify a risk rating for each individual risk. Each of these risk ratings represents a judgment as to the relative risk to the project and categorizes at a minimum, each risk as low, moderate, or high. Based on these risk ratings, key risks, risk handling strategies, and risk communication strategies can be identified.

As with a threat, an opportunity should also be assessed using a risk assessment framework. Risk ratings should be assigned via a matrix to the risk, threat, or opportunity, based upon the risk classification. **Typical risk classifications are low, moderate, or high.** Another option could be to use numerical values for ratings. The numerical value could be tailored to the project or standardized for a program.

Risks that have a determinative impact upon project cost or schedule will generally rate towards the higher end of the qualitative scale. However, a risk's qualitative risk rating, does not necessarily correlate with its determinative impact. Therefore, one should **exercise caution with the lowest rated risks in the qualitative analysis.**

Care should be taken when comparing project risk scores of different projects as the project risk scores are a result of a subjective process and are prepared by different project teams.

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Qualitative risk analysis could also be performed on residual risks and secondary risks, but only after the handling strategy has been determined for the primary risk. Again, the risk owner should validate and accept the risk rating.

As the information is gathered and finalized, **the data should be analyzed for bias and perception errors.** While the data will not be systematically used for a quantitative analysis, it should still be analyzed and perceptions scrutinized.

Following the completion of the qualitative analysis, one should do a review of Project Learning Analysis.

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Other Qualitative Techniques

One qualitative technique that may be used is to **search on the risk register for common causes of risks**. By looking for **risks with common causes**, one can attempt to **find opportunities within the handling responses or strategies as well as commonalities in monitoring triggers, risk owners, or other shared items.** Further, it may be that changes can be made to the scope to avoid the risks that were not apparent when viewing the risks individually.

Another qualitative technique for analyzing risks is to use a network diagram. Using a network diagram to show **what tasks bear the high and moderate risks and where they exist in regard to the critical path** can be a powerful tool in analyzing how much contingency should be set aside for the risk **to ensure that the critical path is not impacted or the risk to the critical path is within a manageable range** for the FPD. The diagram is used to determine the impact to successor tasks, especially those that either impact the critical path directly or will have an impact upon a critical input to the critical path.

The **risk breakdown structure methodology provides the option of demonstrating patterns of risk placement or risk groupings**. For instance, **rather than specifying the risk, the risk is captured as a mark on the grid and grouped** together, **then cut across with another matrix technique such as the work breakdown structure** or the cost breakdown structure.

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The **risk is mapped to the work breakdown structure** element that would be impacted if it occurred. The pattern that emerges allows one to either use the assigned expected value score or to count the number of risks associated with the element. **This method allows attention to be focused on specific areas of risks**.

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Quantitative Risk Analysis

Quantitative risk analysis should be used to estimate the impact of risks on project cost and schedule. Quantitative risk analysis is a numerical or more objective analysis of the probability and consequence of individual risks that **also addresses the extent of the overall project risk through the use of a model.**

The purpose of the quantitative risk analysis is to provide budget and completion date estimates of the effect of the risks on the project using statistical modeling techniques such as Monte Carlo, Quasi-Monte Carlo, sensitivity simulations, and other stochastic methodologies, depending upon the project data.

The simulation produces a Probability Distribution Function (PDF) for a range of possible project outcomes and a Cumulative Distribution Function (CDF) that represents the likelihood that a given probability the project cost or duration will be at or below a given value

Quantitative risk analysis could provide a view of which risks or groups of risks should receive more focused attention. It allows a numerical evaluation of risk on the project at a point in time. The simulations could also assist in **projecting the future cost and schedule of the project, if no other actions are taken**, as well as allow for projections to be run based on options the project could implement.

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Quantitative analysis could also provide a method to determine **the level of cost contingency, management reserve, schedule contingency, and schedule reserve**, when combined with cost uncertainty calculations, that is **required to complete the project within the level of confidence required by the DOE** or NNSA program office.

In general, **quantitative analysis is an attempt to determine how much combined risk the project contains and where and when that risk exists** to enable the project team to focus the project resources appropriately. **Quantitative risk analysis has in the past been reserved for multi-year, large, and/or complex projects** or projects where the program or executive management desires a more informed decision as to the amount of risk that exists on the project. Some DOE offices allow for tailoring with respect to quantitative risk analysis. The reason for this type of tailoring is that quantitative analysis allows for the use of different scenarios and alternatives to the base case. However, for overall low risk projects, as determined by the qualitative analysis, it may be determined that quantitative analysis is not warranted.

Quantitative analysis, when done, could be restricted to only those risks that are ranked higher than low as the overall risk ranking from the qualitative analysis process. When this is done, the magnitude of the underestimation should be addressed. The critical path for the project and the approved budget serve as the primary basis for the risk model and for the project analysis.

It is important to model both risk threats and opportunities. It is suggested that the two types of risk are modeled separately to allow for separate analysis given the different project impacts that the two forms may have.

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Quantifying Probabilities and Impacts for Quantitative Risk Analysis

A complete and well executed qualitative analysis is essential to a quantitative analysis. It will serve as the base for developing the data for input into a simulation model for quantitative analysis.

For each risk, a percent or percentage distribution is assigned to the probability (how likely it is the risk will occur), a dollar value or dollar value distribution is assigned to the cost impact, and a schedule duration impact or duration distribution is assigned to the affected activity in the schedule. **Depending upon the software modeling program being used, the percent may need to be within a specified range.** A variety of probability distribution shapes are available for modeling cost and schedule risk, including triangular, lognormal, beta, uniform, normal distributions, etc. **Definitions and a more thorough discussion of the various distribution shapes, and their applicability, are available in Chapter 12 of the GAO Cost Assessment and Estimating Guide, March 2020.**

In general, the basic concept is implemented as: **EV = ΣPRi x CIRi (or SIRi)**

Where: **EV = Expected Value** of cost impact (or duration impact) of all risks **PRi = Probability distribution** function of a risk occurring **CIRi = Cost Impact distribution** function of a risk occurrence **SIR i = Schedule Impact distribution** function of a risk occurrence.

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[Note: **Σ is not the summation of individual expected values for each risk**, but represents a stochastic (*randomly determined; having a random probability distribution or pattern that may be analyzed statistically but may not be predicted precisely*) process (e.g., Monte Carlo simulation) using the collective probabilities and cost/schedule impacts for all identified risk events.]

Inputs for the calculation include, but are not limited to:

Risk Register.

- **Historical records** (especially where similar risks were handled).
  - **Actual costs**.
  - **Time impact**.
- **Subject matter experts**.
  - **Delphi techniques**.
  - **Interviewing** staff, crafts, retirees, and others familiar with similar work efforts at the site or other sites.
- **Technical records** such as safety analysis documents including the risk and opportunity assessment, quality assessments, safeguards and security analyses, and environmental assessments.

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As information is gathered and finalized, it should be **reviewed for bias and perception errors**. These findings should be **captured in the analysis that accompanies the Monte Carlo simulations.** Consideration should also be given to the success of the identified risk handling strategy and **how the potential failure of the handling strategy will be reflected in the risk impact modeling strategy.** The preferred method for analyzing this risk could be to explicitly include the probability of mitigation success in the quantitative analysis.

Another item that should be considered in this analysis is a **review of any project constraints that may impact the cost and schedule ranges assigned to the risks**. Examples of project constraints include the bounding assumptions identified in the risk management plan or risk analysis, which might limit the impact of certain risks. **If some of the bounding assumptions are unrealistic and introduce risks to the project, then these risks should be included in the risk analysis.**

While some of the constraints may be hard to measure, **they should still be captured**, for significant risks, **in the text of the analysis so that the risks are considered as they make decisions regarding the future handling of the risks and any contingency requests or management reserve applications.**

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The inputs into a Monte Carlo simulation process are normally continuous probability distributions; **however discrete probability distributions can also be used**, where the need for distinct values can be described. The **most common methodology is to use a cost and schedule range, expressed as the optimistic view, the most likely view, and the pessimistic view of the impacts**. However, if no central tendency exists for a distribution, a two-point estimate could also be used.

For schedule impact evaluation, the logic-linked project schedule should be utilized as input to allow the random sampling process to be tied to the critical path analysis. The project schedule should contain sufficient logic linkage between the activities to clearly identify critical path and near-critical path activities.

The Monte Carlo simulation process simulates the full system and its variables (risks) by random sampling the variables many times from its probability distribution.

Each time it develops a modified duration for each risk-related task or activity and determines the project length based on the re-analyzed critical path.

The **results of the independent system realizations are assembled into probability distributions of possible outcomes**. As a result, the **outputs are not single values, but probability distributions**.

A similar process can be executed for cost using the project cost estimate or a detailed cost loaded schedule. Both threats and opportunities should be analyzed.

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While the use of the **Monte Carlo simulation is one of the standards of the DOE/NNSA**, **it does not mean that other forms of quantitative analysis are discouraged**. **Other forms** of quantitative analysis may be used. Suggested other forms of quantitative analysis that may be considered **are decision trees, influence diagrams, system dynamics models, neural networks**, and others.

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Integrated Schedule and Cost Risk

Integrating schedule and cost risk, also known as joint cost and schedule confidence level (**JCL) analysis, generates a representation of the likelihood a project will complete its scope and achieve its key performance parameters on time and within budget.**

Conduct this analysis with risks, prioritized by likelihood of realization and impact, appearing in the risk management plan **and a fully burdened resource-loaded integrated master schedule** with uncertainties associated with activities.

The process uses software tools that examine the schedule and cost implications of the hypothetical realization of risks or manifestations of uncertainty **to generate an integrated probability distribution.**

The Association for the Advancement of Cost Engineering International (AACE International) Recommended Practice (RP) 57R-09, Integrated Cost and Schedule Risk Analysis Using Risk Drivers and Monte Carlo Simulation of a CPM Model, provides a method for simultaneously considering schedule and cost risks.

The AACE RP 113R-20, Integrated Cost and Schedule Risk Analysis and Contingency Determination Using Combined Parametric and Expected Value provides techniques to deal with baselines using combined methods of cost estimating. **Implement JCL on major systems projects in preparation for CD-2 and thereafter.**

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Additional Points of Analysis That Should be Included

The **purpose of providing the additional analysis is two-fold**. **First**, simulation graphs should be **supported with assumptions and data input** (cost and schedule ranges, and probability distributions) **captured for each risk**, and sensitivity analysis conducted to provide the necessary information **to enable an increased understanding of a project's risk exposure**. **Second,** it **provides decision-makers with a basis to engage the project team in discussions** relevant to project risks.

Planning Assumption Validation Analysis

Analyses accompanying Monte Carlo simulation data, including graphs, **should include** the **review of assumptions** that serve as the basis **for planning the budget and schedule of the project from which risks arose**. Since **assumptions have a basis in fact**, **but are not facts themselves**, **they should ensure they are still operable and as accurate as possible.**

DOE G 413.3-7A – cont'd

Cost and Schedule Quantification Range Assumption Data – Gathering Process and Validation Analysis

As the costs and schedule ranges are captured for each risk for input into the Monte Carlo simulation runs, **the assumptions that formed the basis for those ranges should be captured**. The risks that are input may include low risks. The reasons for **capturing those assumptions are to form an historic database for future projects**, an historic database for the current project, a reference to substantiate **how the** projected **federal contingency or the contractor management reserve/contingency was derived**, **and** as a basis to **determine the possible range of error that may exist in the data upon which the Monte Carlo data is based.**

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Alternative Run (Sensitivity) Analyses

A project may choose to execute further Monte Carlo simulations beyond the overall schedule and cost runs. These **may include targeted runs pertaining to specific risks or key risks and their effects on various planned activities or the overall project**. Further groupings of risks may be chosen and the affects simulated against the schedule and cost of the project. Chapter 11 of the GAO Cost Estimating and Assessment Guide provides a more thorough discussion of the benefits of sensitivity analysis, including the steps for performing sensitivity analysis.

In choosing to make these runs, it is important to identify the correlation factors (interdependencies and relationships between risks), **especially when those have become more apparent when the runs are done after the project has been in the execution phase for several months or years.** The constraints of how various risks or similar risks will impact a project will demonstrate characteristics that can be identified and captured as assumptions.

While risks are independently identified in most cases, they operate within the confines of the project and have interdependencies, relationships, **both positive and negative**, as well as dependencies to other projects within the same program area. In other words, there are defined relationships that should be explored. **These relationships can give rise to other latent risks or risks that have remained undiscovered to date until these systematic relationships are reviewed.** Chapter 12 of the GAO Cost Estimating and Assessment Guide offers a relevant discussion of correlation and interdependencies.

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Project Learning Analysis

A section of the Monte Carlo simulation written analysis should focus on the incorporation of project learning, or, in other words, lessons learned. If the project is new, this section may be the transference of learning from other projects. **If the analysis is an update of the Monte Carlo simulation analysis, it should include learning from prior periods.** This analysis should include insight into how risks have thus far presented themselves, how accurate the assumptions and estimations have been, how those assumptions may or may not impact the simulation results, and any other observations that the team finds are relevant to the projections. **If the analysis represents lessons learned that are applicable to other DOE entities, the learning should be distributed by submitting lessons learned.**

In the quantitative analysis, one should discuss whether bias and perception errors could have influenced the data. Such errors in regard to the incorporation of information from **lessons learned can arise from both an overly optimistic or pessimistic view of project status.** This view can result in a misunderstanding of the applicability of the lesson to the project in question, caused by the bias of the project team to the lesson presented or by a variety of sensitivities to the data. The results of reviewing the data and **questioning of whether any bias or misperception could have occurred should appear in the written analysis that accompanies the data.** This analysis is often best provided by independent subject matter experts.

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In regard to the impact on the simulation results**, the analysis should focus on the calculation of the contingency values**. The usefulness of this analysis is in the follow-on risk discussions that occur during the **monthly reviews of risks wherein the impacts of risks are reviewed along with the various assumptions as lessons learned are applied.** By bringing the learning together with the analysis, the FPD and CPM are potentially better prepared for how risks will react on the project or how handling strategies will potentially mitigate the identified risks.

This process of **applying lessons learned is also recommended for projects, which perform only qualitative analysis**.

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Error and Variance Analysis

Depending upon the size of the project and data bank being entered for any given simulation, **it may be necessary to subjectively estimate extreme values to "bound" the magnitude of possible outcomes**. If this case situation arises, it **could introduce random errors into the simulation**, which could potentially impact the results. If this occurs, it should be disclosed and any error or bias should be discussed, as well as any methodology-triangle distribution, for example-used to reduce such an impact (see Attachment 15, Glossary, for definition of triangle distribution).

Risk attitude, the explicitly stated or unstated position that the organization holds towards risk, is one factor that **can influence how risk is handled and how values are assigned and should be included in the analysis**. For example, it influences how one views the ranges of the values and whether future values are considered and how, when considered, they are bounded. **This line of reasoning should be a subject of group discussion in the analysis in an effort to mitigate biases or estimating errors.**

Given that most risk impacts are estimates, some error is expected, and the introduction of some range of error should be discussed. Even though the values generated by the Monte Carlo simulation may be carried to several decimal points, **it is important to remember that these numerical values are indicators, not absolute values.**

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One suitable methodology for analysis purposes is variance analysis. Generally, variance analysis is a tool that is used once the project has been under way for a period of time and has some data from which the project manager and subject matter experts can use for determining the expected values that are used to calculate the variance analysis.

Quantitative and qualitative analyses serve as the foundation for continuing dialog about future risk realizations and the need for the application of the contingency and management reserve.

The written analysis that is derived from the quantitative and qualitative analyses should address how policy has impacted the outcome of the data; the evaluation of the reliability, software relevant issues, other variances which may have been introduced, how a pattern has been applied, what it is and what choices were made to remain consistent in the application thereof and the impact. **The benefits of this approach, relative to other potential approaches, should be addressed.**

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Contingency Adequacy Evaluation

Numerous tools exist to analyze the adequacy of the contingency valuation that has resulted from the qualitative and/or quantitative analysis of the risks.

Various cost estimating guidance documents have been compiled by industry and are available in texts and journals, such as AACE International, and are updated on a regular basis.

These references provide percent ranges of the base that a contingency should represent to be considered adequate.

Further, the contingency value should be commensurate with the maturity and type of the project, project size, and risks, including technical and technology uncertainties.

It should be cautioned that the recommended contingency levels in these documents do not provide a basis for the recommended confidence levels (70 – 90 percent) in this Guide for the derivation of contingency and management reserve by quantitative risk analysis.

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If a quantitative risk analysis will not be conducted, estimates for cost contingency and schedule contingency should be provided. As a general rule, the project should use various inputs to determine those values. **Those inputs may be**, but should not be limited to:

- Historical records.
  - **Actual costs**.
  - **Time impact**.
- Subject matter experts.
  - **Delphi techniques**.
  - **Interviewing** staff, crafts, retirees, and others familiar with similar work efforts at the site or other sites.
- **Technical records** such as safety analysis documents including the risk and opportunity assessment, quality assessments, and environmental assessments.
- Climate change and extreme weather trends utilizing downscaled projection data.

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A parametric estimating model, through mathematical cost relationships, logically and predictably correlates the physical or functional characteristics of a project with its cost. When used in risk analyses, some parametric models relate cost growth to risk drivers such as the level of project scope development and the technology readiness level.

AACE RP 42R-087, Risk Analysis and Contingency Determination Using Parametric Estimating, offers an approach to estimating contingency, but not MR, based on cost data from similar completed projects.

Another AACE RP, 44R-08, Risk Analysis and Contingency Determination Using Expected Value, provides a basis for generating inputs to the methodology appearing in AACE RP 42R-08.

Use the spreadsheet calculator included in AACE RP 43R-08, Risk Analysis and Contingency Determination Using Parametric Estimating – Example Models as Applied for the Process Industries, to make calculations more efficient and transparent. The calculator collects cost and project definition level information.

The contingency estimates produced following this methodology best support cost estimate ranges generated prior to CD-0 and CD-1.

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As the information is gathered and finalized, the **<u>data should be analyzed for bias and perception errors</u>**. While the data will not be systematically used for a quantitative analysis, it should still be analyzed and perceptions scrutinized.

<u>Note:</u> It is suggested that the project's initial estimated total cost and schedule contingency should exceed the amount estimated to account for the known risks, in order to plan for the potential cost of handling unknown or unpredictable risks that may manifest themselves during the project life cycle.

DOE G 413.3-7A – cont'd

Risk Handling

Risk handling covers a number of risk strategies, including acceptance, avoidance, mitigation, and transfer. When weighing these approaches, the following should be taken into account:

- The **feasibility** of the risk handling strategy.
- The expected **effectiveness** of the risk handling strategy based upon the tools used.
- The **results of a cost/benefit analysis**, i.e., how do the costs of the handling strategy compare to the benefits derived from not realizing the risk event?
- The **impacts of the strategy on other technical portions of the project**. Any other analysis deemed relevant to the decision process.
- The **risk handling strategies should be compatible** with the appropriate DOE or NNSA office's risk management policy and the appropriate risk management plan.

Many parameters of the project can change over time that can impact the risk handling strategies (e.g., scope of the project, available resources, internal and external environments, technical advancements, et al.). Thus, **risk handling should be an iterative process.** One or more of these items can change a step in a risk handling strategy, or even the complete strategy, which then changes the cost and/or the schedule for implementation of the risk handling strategy.

DOE G 413.3-7A – cont'd

Risk handling strategies should consider the probability and consequence of the risk and, if deemed necessary by the risk owner, should allow for a back-up risk handling strategy that is documented in the risk register. **If back-up risk handling strategies are documented in the risk register, they should be documented at the same level of detail as the primary risk handling strategy**. Documentation at the same level as the primary strategy will ease implementation if the primary risk handling strategy is deemed unsuitable or inadequate. Further, the cost and necessary schedule for the back-up risk handling strategy should be calculated and noted in the risk register.

The cost for the risk handling strategy for the primary risk should typically be included in the baseline as direct project costs if the handling action will be performed (see further discussion in the following paragraph). The process includes **identifying the scope, cost, and schedule associated with implementing the risk handling strategy**, and assigning a unique work breakdown structure number and activity to the strategy so that it can be tracked and monitored.

The project team should develop the risk handling implementation plans with the appropriate level of detail. The project activities should include the detailed work plans (for whichever phase the project is then in) **with the associated budget and schedule identified in the project Work Breakdown Structure (WBS).** At the appropriate time in the project life (**Critical Decision 2), the handling actions become part of the project baseline.**

DOE G 413.3-7A – cont'd

Some project teams make the mistake of thinking that all handling costs should be part of the project contingency. **If the handling actions will be performed, then DO NOT include the costs of these handling actions in the risk contingency [or contractor Management Reserve (MR)].**

These are known, identified project work activities and need to be planned accordingly, and included as part of the direct project costs.

However, if the handling action will not occur until some event that may or may not occur, e.g., a risk trigger event, then it is appropriate to assign those costs to project contingency (contractor MR).

If the triggering event occurs, then the project would process a change using the project change control system, to take cost/schedule from contingency (or MR) and assign it to the project handling activities. This latter approach is more the exception than the rule.

There may be occasions when a primary risk is not added to the baseline until a change control action occurs, such as when it is predicted during a monthly project review or a review of lessons learned.

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Risk handling strategies should be regularly reviewed throughout the project life cycle for their affordability, achievability, effectiveness, and resource availability as described in the reporting requirements of the risk management plan.

If questions arise about a risk or its handling strategy's potential impacts on the technical goals and objectives of the project, **a more comprehensive analysis should be conducted.**

Major/Key risks should be analyzed to examine the inter-relationships between other risks, as well as other projects. This could lead to common risk handling strategies. The specific method of analysis may include:

- Pictorial **modeling**.
- Fish-bone **diagramming**.
- String diagramming.
- **What if analysis** systems modeling.
- **Time-specific sequencing simulation** modeling.

DOE G 413.3-7A – cont'd

Acceptance

Acceptance as a risk handling strategy **should be a deliberate decision and documented in the risk register**. **Acceptance of the risk does not mean that the risk is ignored**. The risk should be included in the cost and schedule contingency impact analysis.

Examples of risks that might be accepted include:

- There will be **fewer bidders** on a design-build request-for-proposal than desired, but there will still be some competition.
- **Funding** for the next fiscal year **is delayed** due to Continuing Resolution.

DOE G 413.3-7A – cont'd

Avoidance / Exploit

Avoidance, as a risk handling strategy, is done by planning the project activities in such a way as to eliminate the potential threat. Avoidance **should be considered the most desirable risk handling strategy.** However, avoidance should be analyzed for its cost/benefit to the project within the current funded boundaries of the project.

The cost/benefit analysis should also take into consideration the impact on the overall project and the available funding for handling the other identified risks. **The decision processes used to determine whether or not to pursue the avoidance risk handling strategy for risks on the project should be documented.**

Avoidance strategies often involve a change in requirements, specifications, or practices to eliminate the risk. Avoidance can also be the rejection of an approach to doing a piece of scope, as the risk involved in the approach cannot be reduced to an acceptable level. **In general, to exercise this approach, another approach that meets the cost/benefit approach should be available.** Examples of risks that might be avoided include:

- The design specifies **using an untested material** of construction in this application.
- The design **specifies a non-conventional/untested glove-box in a nuclear facility**.

DOE G 413.3-7A – cont'd

The term exploit is used for positive benefit risks. To exploit an opportunity is to attempt to ensure that it occurs. **As in the avoidance of the negative consequence risk, the thrust of the handling strategy is to ensure that uncertainty is removed and the opportunity definitely happens.** In addition to avoidance, exploitation should be analyzed for its cost/benefit to the project.

Examples of exploitation strategies include:

- **Remove the uncertainty of whether or not human resources will be available for an action at a certain time**, one may extend the contract and have the resources available and working on other efforts at the site. Thus, it is ensured that the resources will be available for the project.
- **Pursue a new process configuration that eliminates the requirement for Building A in the project scope**.

DOE G 413.3-7A – cont'd

Mitigation/Enhance

Mitigation is a risk handling strategy that is taken to reduce the likelihood of occurrence and/or impact of an identified negative risk or threat. Enhancement is a risk handling strategy used to increase the likelihood of occurrence and/or benefit of an identified positive risk or opportunity. **The goal of a mitigation risk handling strategy is to reduce the risk to an acceptable level**.

In regard to the introduction of technologies or technologies needing further development, the **technology development plan should be linked directly with the risk handling strategy for risks associated with technology development or availability**. Deployment or implementation of a technology may introduce risk that requires specific risk handling strategies.

The risk's mitigation strategy should be developed as a step-wise plan that can be included in the project baseline. The mitigation plan should be analyzed to ensure that it is feasible and that resources are available.

DOE G 413.3-7A – cont'd

An example of a step-wise risk mitigation strategy for a primary risk might be as follows:

- Establish **weekly requirements and interface meetings** for design teams (set date).
- Establish a **separate design review for the interfaces** for where technology interfaces occur (set date).
- Establish a **separate design review for any rework** that should occur for technology interfaces (set date).
- Establish **separate contractor and DOE walk-down** of facility once technologies are on- site to determine that visual interfaces concur with designs (set date)
- Establish **walk-down of facility with technical staff to ensure quality, design, safety,** and other necessary requirements for staff concurrence with all interface design features as physically installed (set date).

DOE G 413.3-7A – cont'd

<u>The term enhance is used for positive benefit risks.</u> The necessity of identifying the trigger event is highlighted by attempting to enhance the opportunity by reinforcing the conditions identified in the trigger event. An example of an enhancement strategy is:

- **<u>Restructure the project scope/contracts to make the project more attractive to potential bidders</u>**, thus increasing the pool size of responsive bidders.

<u>Mitigation and enhancement, as risk handling strategy decisions, should also be based on the results of a cost/benefit analysis.</u> The rule for mitigation is not to spend more on the handling than what the risk event would cost if it occurs. Likewise, it makes little sense to spend more on the enhancement costs than the cost savings realized from the opportunity.

DOE G 413.3-7A – cont'd

Transfer/Share

The risk handling strategy of transferring risk operates differently within the DOE or NNSA **than within private industry**. In private industry, transferring risk often involves the purchase of insurance or bonds as the transference of the risk. The risk is passed to the insurance company that accepted the risk for a fee. **For non-M&O type contracts, the actual risk is transferred between the FPD and the CPM via the contract or from one project to another, or to a program office.** Risk transference indicates a transfer of ownership, and therefore **written acceptance of the risk should be obtained before transfer is complete**. An example of a risk that might be transferred from DOE to a contractor is:

- Contractor assumes material cost escalation up to 10% above current prices.

Examples of risks that might be transferred from the contractor to DOE include:

- DOE is responsible for **material cost escalation** exceeding 10% of current prices.
- Site **utilities are available for tie-in to the project**.

DOE G 413.3-7A – cont'd

When risk has been transferred, the transfer of the risk should be reviewed to ensure it did not create other risks and that it does not impact the project mission and objectives. Therefore, as was done for the acceptance strategy, an **analysis review should be conducted to fully understand inter-relationships.**

The term **share is associated with risks that present positive consequences**. For instance, a risk **could be shared between the FPD and the contractor**, between and among various projects, or a combination thereof. In general, the **risk benefits should extend to the parties that shared the risk**. If a risk is shared it should be split such that each "owner" is responsible for the appropriate portion of the risk. An **example** of a shared risk might be:

Incentivized contracts that allow for sharing of any cost savings derived from implementation of contractor value engineering suggestions. Note: The appropriate portion of the opportunity should be assigned to each party affected so there is a clear owner and benefit.

DOE G 413.3-7A – cont'd

Residual Risk

Residual risk (post-mitigated risk) is the risk that remains after the risk handling strategy (accept, avoid, mitigate, or transfer) has been performed to the original primary risk to which they had been assigned in the risk register. A residual risk may end up being the same risk as the original risk (pre-mitigated risk) if the risk handling strategy does not reduce or mitigate the risk or the risk is one that recurs**. The fact that residual risk remains** does not mean that the **risk handling was not effective**, only that it **did not completely avoid a risk remaining**. It is up to the risk owner to decide whether the residual risk will be moved to a primary risk position.

This remaining or **residual risk should be qualitatively analyzed**. Through this process a decision should be made as to when the risk planning process should stop. Those **residual risks for which no risk strategies are planned are accepted** and should be clearly communicated to the team and management.

DOE G 413.3-7A – cont'd

Once it has been determined that the residual risk will remain after the implementation of the primary risk's risk handling strategy, **the primary risk should be closed.** The **residual risk should be moved to a primary** position **on the risk register**. The purpose of this suggested move is to provide focus attention to this risk through the risk register.

Once moved to the primary risk position, the **risk handling strategy for the risk should be reviewed and updated, if necessary**. If a **back-up strategy** was also logged into the risk register at the time the residual risk was captured, it **should be reviewed** for applicability also and determined **if it is the better risk handling strategy** or **if the two risk strategies should be merged, blended, or completely redrafted.**

All steps that were conducted with primary risks in regard to the baseline will need to be accomplished with the new primary risk, if necessary, in regard to the baseline. In other words, a review of the baseline should be done for **change in cost and schedule contingency to be made at the discretion of the FPD and/or CPM in consultation with the IPT.**

DOE G 413.3-7A – cont'd

Risk Monitoring

Risk monitoring involves the systematic, continuous tracking and evaluation of the effectiveness and appropriateness of the risk handling strategy, **techniques**, and **actions established within the risk management plan**.

Monitoring is performed for individual risks per the risk metrics **and overall project risk status**.

The **risk monitoring process should provide both qualitative and quantitative information** to decision-makers regarding the progress of the risks and risk handling actions being tracked and evaluated.

Risk monitoring may also provide information that can assist in identifying new risks or changes in the assumptions for risks captured previously on the risk register.

These results should be used to initiate another risk identification process.

DOE G 413.3-7A – cont'd

Risk Monitoring Process Considerations

The **Risk Monitoring process should be tailored to the project** and be described in the risk management plan. The **risk monitoring process should be more than a risk tracking documentation process** and should include the following items:

- Ensure that the **risk owner is current and performing** his or her role and responsibilities.
- Ensure that **risk identification is current with the parameters of the project**. Ensure that risks, including accepted and low risks, have not changed since first identified.
- Ensure that **avoidance strategies are implemented** according to schedule, and that metric indicators are showing that the risk is not presenting itself.
- Ensure that risk **handling strategies are being implemented and executed** to meet or exceed metrics for success.
- Review any **back-up plans for applicability** and determine if any other plans need to be put into place based upon performance of the current handling strategies.

DOE G 413.3-7A – cont'd

- **Review the cost and schedule contingency calculations for the current handling strategies** that are being implemented and those that will be implemented in the near future based upon recent project performance **for projected accuracy**. That is, **compare current risk handling performance with the corresponding risk handling plans in the risk register** (before the implementation) to measure current performance. **Make adjustments to those risks handling actions that will be implemented in the near future based on recent performance** for projected accuracy.
- **Review** any necessary **risk management communication that may be necessary for any current or near-term risks for executive management, customers, stakeholders**, or others and review such communication **against the risk management communication plan**.
- Ensure the **recognition of the benefits and necessity of early consideration** and integration of safety and security-related project risk into the project risk management process.
- Ensure that the **risk register and other risk-related forms are up-to-date**.
- **Conduct integrated metrics management and reporting**

DOE G 413.3-7A – cont'd

Risk Monitoring Methods

The following are not the only methods available and do not exclude the use of other methods acceptable to the Program Office.

Risk Owner Monitoring

The **risk owner has a significant role in risk monitoring**. As part of the risk monitoring process, the **risk owner should update information in the risk register** through an agreed upon process as stated in the risk management plan. Any **changes that a risk owner makes to the risk register should be discussed at the risk meetings** to ensure that changes in the conditions of one risk do not impact another risk or create another potential risk. It **may be necessary to conduct an analysis study depending upon the extent of the impact** of the change to the risk register.

Self-Assessment

At various junctures during the project, there might be a need to **assess the risk management processes that have been implemented**. In such a case, the respective manager may wish **to use a review document designed for the particular project or a generic checklist**

DOE G 413.3-7A – cont'd

Risk Monitoring Checklist

Item Number	Item	Yes/No	Comment
1	Risk handling strategy was implemented as planned		
2	Risk handling strategy was effective		
3	Back-up risk handling strategy was required to be implemented		
4	Risk assumptions were valid		
5	Project assumptions were valid		
6	Risk monitoring trigger was valid		
7	Risks were correctly noted in risk reports		
8	Risk was on team meeting agendas		
9	Risk monitoring was conducted per the Guide		
10	Risk was integrated into Earned Value discussions		
11	Were unidentified risks discovered		
12	Was contingency associated with a given risk sufficient		
13	Were risks captured in the risk register and updated		
14	Was a risk brainstorming session or scenario planning session used to identify risks		
15	Was a subsequent session for identification of risk conducted to update the risks identified		
16	Were lessons learned captured during the risk process		
17	Were lessons learned distributed during the risk process to the project team		
18	Were lessons learned distributed during the risk process to other project teams		
19	Were any systems analysis or decision analysis methodologies applied, especially for such items as technology readiness level implementation		

DOE G 413.3-7A – cont'd

Integrated Risk Monitoring

Integrated risk monitoring occurs when risk management metric monitoring is integrated with other standard project metrics such as earned value or safety metrics. The determination as to the **root cause of** any **negative or positive impact** upon a metric **should include a determination as to whether it involved a risk** including whether it involved the positive benefit risk known as an opportunity. The **output of the reporting process can be the input to the risk management process** for **further risk identification**, **analysis of consequence** and **impact ratings**, and the analysis of the **handling strategy** as planned or as being implemented.

If the project is subject to DOE-STD-1189-2016 for integration of safety into design, the **key risks should be tracked and reported per the requirements of the standard** and in relationship to the maturity of the project and technical studies that are ongoing. The **DOE-STD-1189-2016 provides for the development of risk and opportunities assessments relative to safety in design issues and decisions**. Given the potentially significant costs associated with safety decisions, the integration of safety into **the design process needs to also include a strong link between the development of Safety-in-Design and identification of project technical and programmatic risks.**

DOE G 413.3-7A – cont'd

With anticipated risks, early identification of possible opportunities to address potential risks allows the project to define appropriate cost range estimates.

Comprehensive risk identification, coupled with an appropriately conservative safety design posture, **affords the project the opportunity to execute within the range estimate with a higher degree of reliability.**

The project's **risks and opportunities assessments** are intended to be **inputs to its Risk Management Plan** and to be managed accordingly.

DOE G 413.3-7A – cont'd

Safety Metrics

Safety metrics should be used to measure the effectiveness of the safety program, and various administrative, personnel protection, and engineering methodologies being used to achieve worker and public safety. Various metrics are used in the program offices. Among those metrics are the measures of the **occurrence of certain events including electrical safety events, industrial events, radiological events, and near miss events,** etc. For the **purposes of risk management**, the performance assessment that is done in regard to safety **should involve a review of events to determine whether or not the event involved a risk, an event that could have been predicted and thus could have been avoided.**

If such a risk is determined to have been part of the safety event, **lessons learned should be conducted** in accordance with the applicable safety order. All **related projects should undergo a review for an exact risk or similar risk and the application of the lessons learned.**

If the project is subject to DOE-STD-1189-2016, the key risks should be tracked and reported per the requirements of the standard and in relationship to the maturity of the project and technical studies that are ongoing.

DOE G 413.3-7A – cont'd

Quality Metrics

Quality metrics should be used to measure quality assurance and quality control processes. Project activities and processes should have a set of metrics. If a metric is not met, an analysis of this shortcoming should be done to determine the reason. **If the reason for the non- achievement of the metric is a realized risk, an analysis of the risk should be initiated to determine whether the risk was identified, and, if not, why it was not identified**. Additionally, **a reflective analysis** process may be **needed to determine if the risk was hidden or latent due to other risks** or perhaps other project factors. **Lessons learned should be gathered** and applied to the project and other similar projects.

If the risk was identified, the **analysis should determine if the risk operated as predicted per the assumptions surrounding the risk, or the handling strategy or response was inadequate**, or the residual risk was greater than anticipated, **or the accepted risk was greater than what was anticipated**.

Again, **a full analysis should be done and shared** with the project participants and other similar projects. If the risk only allowed for partial achievement of the metric, then the handling strategy should be reviewed, especially if the risk is one that could recur or is one that is found on other projects.

DOE G 413.3-7A – cont'd

Safeguards and Security Metrics

Safeguards and security metrics should be used to measure the implementation of the safeguards and security requirements for a given project. These compliance and performance assessment metrics as defined in DOE G 413.3-3, Safeguards and Security for Program and Project Management, current version, could be established and integrated early in the project planning.

Using these metrics on a monthly basis to highlight either the **avoidance** of an identified risk or the **mitigation of a risk** in this area of project integration **will form a basis for continuous and iterative risk feedback**.

Further, **if a risk** in the area of safeguards and security **is realized that was not previously captured** on the risk register, **it should be reviewed and analyzed**.

This r**eflective analysis process may be needed to determine if the risk was hidden or latent due to other risks** or perhaps other project factors. **Lessons learned should be gathered** and applied to the project and other similar projects.

DOE G 413.3-7A – cont'd

Risk Reporting

Although reporting can be either formal or informal, **this guide will focus on suggested formal risk reporting**, but **acknowledges that informal risk reporting occurs in the field** through casual conversations and interactions.

While **there are thresholds for reporting requirements stated in this guide**, each project **might vary based upon tailoring and risk communication requirements that will be stated in the risk management plan** and the risk management communication plan.

In addition, **the FPD is encouraged to work with the appropriate DOE program office** (i.e., EM, SC, NNSA, etc.) **to establish the specific reporting requirements** for the individual project.

DOE G 413.3-7A – cont'd

Risk Feedback

Risk feedback is a continuous and iterative activity throughout the risk management process. Participants in the risk management process **should provide feedback throughout the project**. This feedback process **begins with the initial identification** of the overall risk of the project at the mission need phase of the project, CD-0, **to the project close out, CD-4, and the capture of the final lessons learned**. This process should begin as early as possible in the project **and should be a thorough risk and requirements feedback process.**

The process of providing feedback can be done either in a formal or informal manner—either in a written or oral format. However, **it is recommended that wherever possible, feedback should be provided in a formal, written format to ensure that it is captured, and that it is recorded and received by the appropriate project official, whether it is the risk owner or the FPD and/or the CPM.**

The risk management plan may prescribe the method for certain types of risk feedback and presentation. The types of risk feedback that the risk management plan should prescribe, but are not limited to, include reporting, official responses to reports, and maintenance of the risk register.

DOE G 413.3-7A – cont'd

RISK DOCUMENTATION AND COMMUNICATION

Project Execution Plan

The risk management plan **should be included** in or referenced **in the project execution plan**.

Baseline Management

Changes to the baseline due to risks not identified will generally result in the filing of a change control document. When a baseline update has occurred, **a full review** of the risks **should be done to ensure that the baseline change has not resulted in other risks that may occur in the future** due to the change either in schedule, budget, or scope. Those **risk handling strategies not part of the project baseline will have cost and schedule impacts, if implemented at a later date**.

If the project has had scope changes or other impacts that have resulted in changes to the project's risk profile, **the risk identification process should be re-initiated and the risk register resubmitted** either in hard copy or electronically during the reporting period when the changes are noted.

DOE G 413.3-7A – cont'd

Phase Integration

Risk management and its processes should be tailored to the specific project phase. For example, risk management should be started on a project when it has the greatest impact, which means, **generally, at the development of the mission need statement**. The degree to which it can be started will depend upon each project and the knowledge possessed at the time.

It is recommended to ensure that risks are represented, and risk handling actions are suitable for the phase of the project. In other words, **the response should satisfy a cost/benefit analysis for the phase or timing of the implementation of strategy whether it is early in the project or late**, and that the schedule to implement can be done within the project **without impacting other milestones or critical activities**.

DOE G 413.3-7A – cont'd

Acquisition Strategy

The FPD should enlist the assistance of the Contracting Officer early in the initial development of the Acquisition Strategy in order to identify the risks to the procurement of the project resulting from key project decisions. When developing the acquisition strategy documentation, the FPD and the Contracting Officer should direct attention to risk identification, consistent with FAR 34, in the following areas as input to the acquisition decisions:

- **Cost** - as it relates to the facility, technology, or system to achieve the project's mission objective(s).
- **Design and Engineering** - as it relates to the facility, technology, or system to achieve the design and/or engineering objectives.
- **Functional** - as it relates to the facility, technology, or system to perform or meet project requirements.

DOE G 413.3-7A – cont'd

- **Integration** - as it relates to the integration of any hardware or software for various systems for the facility, technology, or system and the demonstration of this integration to meet project requirements.
- **Procurement Vehicles/Process** - as it relates to the procurement decision process, contract requirements, available competition, market conditions, and other constraints.
- Regulatory - as it relates to the physical site, environmental conditions and process needs, facility requirements, and any other project specific regulatory requirements.

Other risk categories may need to be reviewed within the acquisition strategy and planning activity and, as they are captured; they should be tracked in the risk breakdown structure under the appropriate category and in the risk register.

DOE G 413.3-7A – cont'd

Risk Management Plan

The risk management plan is the governing document for the risk management process on a project. The **risk management plan includes** by reference the risk **register, risk analysis, and other risk data and risk database information that is updated** more frequently (but is not reissued whenever such data is changed or updated). Results from the risk analyses (MR, contingency, confidence level) are recommended for inclusion in monthly progress reports if the analyses are updated more frequently than annually.

DOE G 413.3-7A – cont'd

Note: **Tailoring the risk management plan is based upon criteria such as the size, complexity, budget, risk level, resources, technical maturity level, and other considerations deemed relevant.** The risk management plan should include the following sections:

Introduction (may be contained in project execution plan)	Risk and opportunity management process
Project summary	Risk planning
Responsibility Assignment Matrix (see Attachment 3, Risk Responsibility Assignment Matrix)	Risk assessment
Key definitions	Risk identification
Key requirements documents and regulatory drivers	Risk analysis
Assumptions and constraints	Risk and opportunity handling
	Risk monitoring
	Risk feedback
Risk documentation and communication	**Conclusion**

DOE G 413.3-7A – cont'd

Risk Management Communication Plan

Communication is identified in DOE O 413.3, current version, as a key principle to project success. To ensure project success **the risk management plan should address how information related to risk, and risk status is communicated to the project team and stakeholders.** This communication information **could be addressed in either the project execution plan or a communication plan or could be included in the risk management plan.** A separate risk management communication plan could also be developed as part of the tailoring decisions. **The risk management communication plan should also specifically address the integration points with the DOE enterprise-wide lessons learned systems.**

It is recommended that the risk management communication plan should contain the following sections:

DOE G 413.3-7A – cont'd

Background and purpose

a. Responsible office and key individuals

b. Necessary oversight and signatory responsibilities

II. **Project overview**

III. **Target objectives**

a. Development of standard, and as needed, communication formats and messages for identified risk stakeholders

b. Development of communication flow diagrams

IV. **Strategy**

a. Statement of overall strategy elements

b. Assumptions and uncertainties

c. Process for validating and verifying assumptions and uncertainties

V**. Key target stakeholders**

a. Identification process

b. Known stakeholders

DOE G 413.3-7A – cont'd

VI Identified communication channels for each target stakeholder grouping

a. Process for identifying key points of contact

(1) Primary point-of-contact

(2) Back-up point-of-contact

b. Process for identifying key points of contact for emergency communications

VII. Key messages

a. Site communication requirements

(1) Goals and objectives

(2) Processes

b. When certain communications may be issued

c. Definition of various modes of communication

d. Situational requirements

e. Definition of special circumstances

f. Definition of special approval channels

DOE G 413.3-7A – cont'd

g. Communication development

(1) Who should be involved in construction of communications

(2) Who should review

h. Standard messages

i. Key interfaces

j. Communication distribution and feedback

VIII. Roles and responsibilities

a. Identify all parties

b. Responsibility assignment matrix

IX. Overview metrics for responsible persons

X. Message approval process

XI. Revisions and updates

DOE G 413.3-7A – cont'd

TAILORING OF RISK MANAGEMENT

Programs may adopt other acceptable methods/approaches as deemed appropriate. The process could be tailored **based upon the complexity**, **size**, and **duration** of the project; initial overall risk determination; organizational risk procedures; available personnel and their skill levels for performing risk management; and available relevant data and its validation.

DOE G 413.3-7A – cont'd

APPLICATION OF CONTINGENCY AND MANAGEMENT RESERVE FOR NON- M&O CONTRACTS

Explanation of the Terms

This section **provides clarification guidance for** the definition, derivation and consistent application of the terms **government contingency and contractor management reserve (MR)** in risk management for DOE capital asset projects. This clarification guidance **is in accordance with the requirements of DOE Order 413.3B and the Federal Acquisition Regulations (FAR).** This clarification guidance is also consistent with Acquisition Letter 2009-01, "Management Reserve and Contingency," dated October 6, 2008 from the DOE Office of Procurement and Assistance Management. Contingency management should be an integral part of the DOE capital asset project risk management process, providing project managers with the tools to respond to project risks and uncertainties that are inherent in all DOE projects. With appropriate management and funding of projects, coupled with well-administered Federal and contractor Risk Management Plans and Change Control processes, project baselines should be well suited to deal with anticipated project risks. The **government cost estimate should include contingency for all risks that will impact the project during the development of performance baselines.**

DOE G 413.3-7A – cont'd

When the government issues a solicitation for work to be performed, the terms of the contract establish which work scope risks are borne by the contractor. **The offeror and/or contractor is expected to account for the contractor's risks when proposing quantities, costs and schedules in their response to the RFP.** As a part of the execution of the work, certain of these risks will be realized, certain risks will be mitigated, and additional risks within the contractor's responsibility could emerge.

The terms "contingency" and "MR" are often used interchangeably in Project Management and Contract Management activities during the execution of the work scope creating confusion about its proper accountability. **Using these terms interchangeably should be discouraged.** And, **while MR is a form of contingency, its application is the responsibility of the contractor**.

Contingency derivation and management is the responsibility of the project team. It is advisable that all parties understand the differences and manage each funding source accordingly.

DOE G 413.3-7A – cont'd

Contracting Approach for Non-M&O Contracts

"Contingency" and "management reserve", as defined in DOE O 413.3B, are not synonymous with those provided in the FAR. In fact, the term **"management reserve" is not used in the FAR**, and **is not considered a discrete element of cost.** Within the **FAR, the term "contingency" refers to contractor contingency and not Government contingency, as defined by DOE O 413.3B.** If MR is not recognized as a discrete element of cost such as labor, overhead, materials, etc., how then is it factored into a contractor's cost proposal and negotiated into the contract? The answer is that the **FAR does allow for contractors to price in contingencies** that meet specific conditions, i.e., **"those that may arise from presently known and existing conditions, the effects of which are foreseeable within reasonable limits of accuracy"**, such as escalation for out-year prices, anticipated costs of rejects and defective work, etc. In fact, FAR 31.205-7 states that **"contingencies of this category are to be included in the estimates of future costs so as to provide the best estimate of performance cost."** As a general matter, in a cost proposal, contractor contingency should be tied to specific work scope and be proposed as standard cost elements recognized by the FAR. What this implies is that the contract price is not allowed to explicitly call out a separate budget for management reserve, since reserves for uncertainties within the scope of the contract are expected to be included within the contractor price. **Management reserve is carved out after the contract value has been negotiated.**

DOE G 413.3-7A – cont'd

While **DOE Acquisition Letter 2009-01 provides an extensive discussion of pricing of contractor reserves**, a source of confusion has been the interpretation of certain guidance stated in AL 2009- 01 with respect to the DOE O 413.3B project management model. Specifically, AL 2009-01 states —**Contracting officers shall not include in the contract price any amount (for management reserve, contingency, etc.)** to cover prospective requests for equitable adjustments, changes, or risks that might or might not occur during performance."

Equitable adjustments, changes to the contract pursuant to the Government Changes Clause (FAR 52.243-1, 2, 3, 4, 5, or 6), **and other unknown risks do not satisfy the requirement that contractor contingencies that are priced into a contract must be those that arise from presently known and existing conditions**, the effects of which are foreseeable within reasonable limits of accuracy.

Changes to the contract, equitable adjustments, and other unknown risks simply cannot be reasonably priced. Changes of this nature are **generally handled through the "Changes" clause after contract award as long as the change is within the general scope of the contract.**

DOE G 413.3-7A – cont'd

FAR 31.205-7 also requires that **contingencies**, "the effect of which cannot be measured so precisely as to provide equitable results to the contractor and to the Government; e.g., results of pending litigation", **are to be excluded from cost estimates and should be disclosed separately (including the basis upon which the contingency is computed)** to facilitate the negotiation of appropriate contractual coverage.

The expectation is that the contractor's proposal includes a clear statement of assumptions and risks that are part of the contractor's proposal to perform the work listed in the solicitation that may have either a positive or negative effect on the Government's proposal evaluation.

DOE G 413.3-7A – cont'd

Contract Considerations for Non-M&O Contracts

The discussion thus far is primarily focused on cost reimbursement contract types. **However, additional discussion on the relationship between risk and contract type is warranted, especially with respect to firm fixed price contracts.** Firm fixed price contracts are frequently utilized for capital asset projects throughout the Government. **The issue of risk assumes a different complexion in a fixed price environment because the cost risk is wholly borne by the contractor**, the contractor is generally not required to provide cost data to the Government, **and they are not required to provide visibility into the formulation and use of their MR**. Projects that can be priced on a firm fixed price basis will tend to be well-defined and characterized in terms of work scope. **Cost overruns are absorbed by the contractor, not the Government.**

Under a cost reimbursement contract, the tools, processes, and systems that are required to award and administer the contract reflect efforts to mitigate cost and performance risk that **in a cost reimbursement environment are primarily borne by the Government.**

DOE G 413.3-7A – cont'd

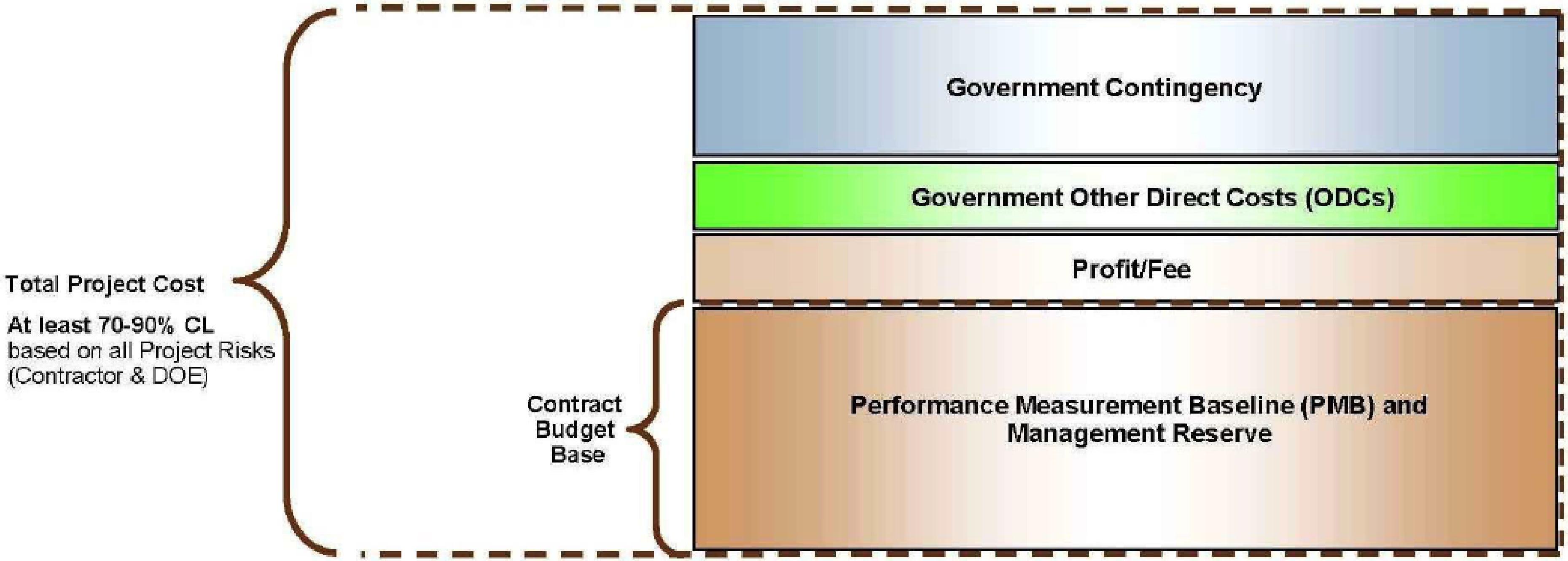
An additional consideration with respect to managing risk on a capital asset project is whether it **will be performed by the prime contractor**, a **first tier** subcontractor, or a **lower tiered subcontractor.** FPDs and Contracting Officer's Representatives (CORs) should always be mindful that **the Government only has privity of contract with the prime contractor**, and **not with subcontractors**, therefore, the Government's desire to manage a project should carefully account for the role of the prime contractor in directing subcontractors and managing risk for the work scope that has been subcontracted.

DOE G 413.3-7A – cont'd

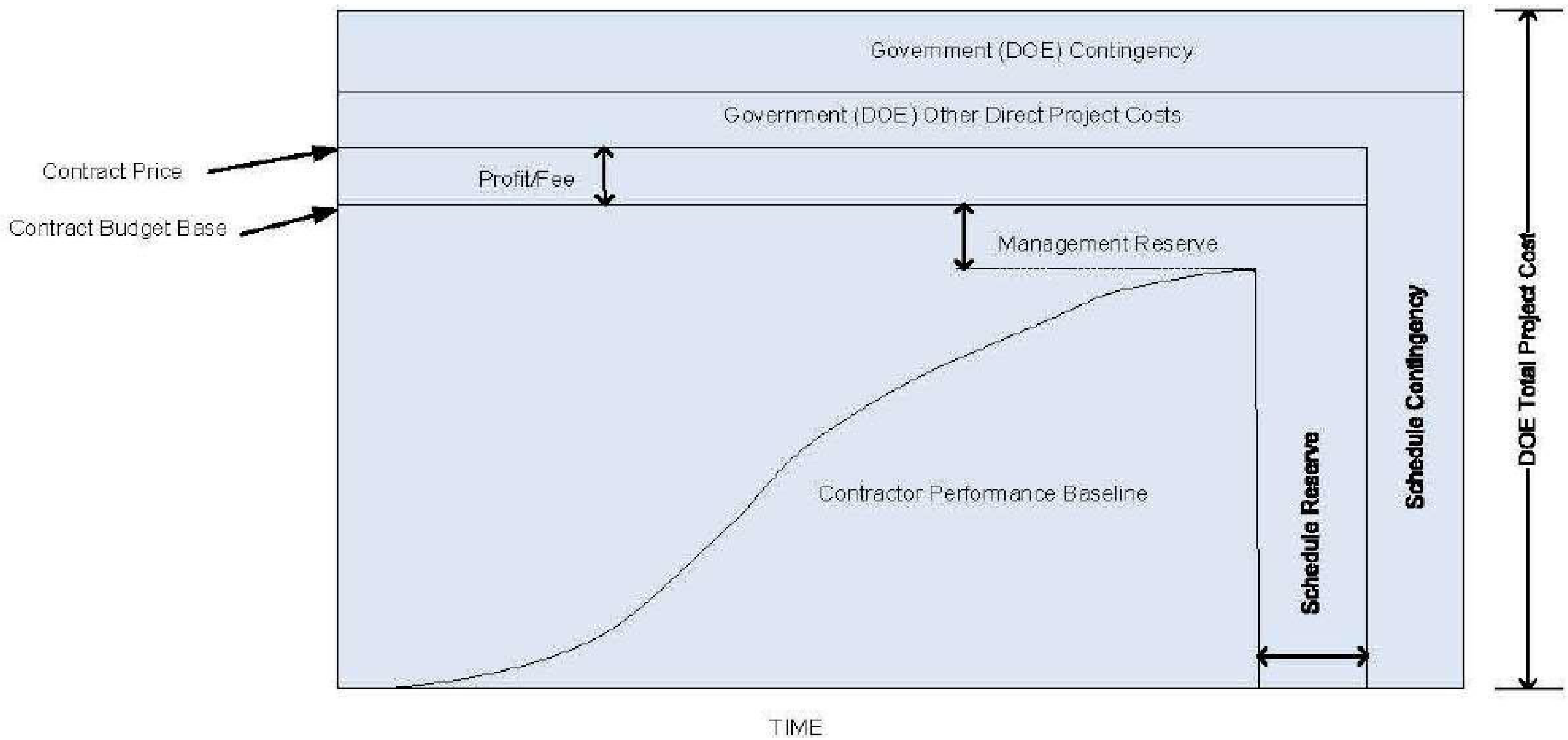
Project Management Approach for Non-M&O Contracts

DOE O 413.3B prescribes a project management model that supports effective contract management. To comply with DOE O 413.3B, **the contractor will establish a Performance Measurement Baseline (PMB) for the contractor's scope of work** and a **Management Reserve (MR) for managing contractor risks**. The cost element of the PMB is the total time-phased budget plan of the work breakdown structure (WBS) elements with the contractor's estimate of the planned cost and schedule to accomplish each WBS element. It depicts the schedule for expenditure of the resources allocated to accomplish contract scope and schedule objectives and is formed by the budgets assigned to control accounts and summary-level planning packages, if any, plus any undistributed budget. **The PMB cost plus the MR equals the contract cost (or Contract Budget Base).** The contract **cost plus the contract fee equals the contract price.** The contract price is the total estimated cost for the contract

DOE G 413.3-7A – cont'd



DOE G 413.3-7A – cont’d



DOE G 413.3-7A – cont'd

A performance baseline (PB) as established in DOE O 413.3B is established after sufficient design has been accomplished to provide sufficient certainty the scope of work can be completed within cost and schedule. The FPD defines a cost, schedule, performance, and scope baseline. **The Government will define a scope of work** to be accomplished by the contractor in a solicitation **and determine the risks to be assigned to the contractor.** As outlined above, the offeror and/or **the contractor's proposal** in response to the solicitation **will propose** a technical approach and incorporate the necessary quantities, cost, and schedule to accomplish the work **and handle the risks to accomplish its proposed approach**. And then, **after the contract is awarded**, the contractor will prepare a PMB and MR.

The FPD also assigns certain risks to the Government, such as government furnished services and items (GFS/I), significant revisions to regulatory requirements, etc. Through analysis of these risks, **the FPD establishes needed contingency**. This contingency is often referred to as DOE contingency to provide clarity from "contingency" referred to in DOE Acquisition Letter 2009-01. **And the "contingency" in DOE Acquisition Letter 2009-01, is MR in DOE Order 413.3 guidance.**

DOE G 413.3-7A – cont'd

Risks for all capital asset projects should be analyzed using a range of 70-90% confidence level upon baselining at CD-2 and reflected in funded contingency, budgetary requests, and funding profiles. Projects should contact their sponsoring program office for additional program and project-specific guidance on the confidence level to be used for analysis. **If a project has a performance baseline change, the FPD should consider reanalyzing the risks at a higher confidence level** and then reflecting this in budgetary requests and funding profiles**. DOE does not provide confidence level guidance for the determination of MR by the contractor.** Consistent with DOE O 413.3B, the contractor is expected to complete the full contracted scope of work.

The work for a Federal Project can have multiple contracts for the execution of the work. Also, a single contract can execute work for multiple Federal Projects. In establishing the PB when contracts are in-place, **the PB will comprise the contractor's price (PMB plus MR plus fee) plus contingency and any Government other direct costs** (see Figures 4 and 5 above). **The confidence in the PB will be reflected in budgetary requests, and funding profiles.**

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DOE G 413.3-7A – cont'd

The amount of MR should correlate with the quantification of the uncertainties and risks identified by the contractor in their Risk Management Plan. During execution, the contractor inherently challenges each of their cost account managers, as well as managers responsible for executing the work (i.e., cleanup, demolition, design, procurement, construction) to accomplish the PMB within the cost and schedule for each work element.

The MR provides the contractor with a mechanism to fund a risk should it be realized.

MR should be maintained separately from the PMB and is utilized through the contractor's change control process. MR is established after contract award by the contractor.

MR should be risk based, and quantitatively derived and justified. Thus, the **MR is a project management tool which allows the contractor to manage risks and uncertainties.**

Through the risk planning and assessment process, the **contractor forecasts the realization and/or mitigation of risks and the utilization of MR**.

MR should not be managed by the government nor deducted from the total estimated contract price, since the underlying costs were supported through the contractor's proposed scope, cost, and schedule to execute the work and evaluated by the Government.

DOE G 413.3-7A – cont'd

When a pre or post award integrated baseline review (IBR) is required in accordance with FAR Subpart 34.2 and 52.234, the contractor should demonstrate the ability of the PMB to successfully execute the project and attain cost objectives.

This demonstration can best be achieved by identifying the threats and opportunities that the contractor has priced in its bid proposal and the approach to be used in managing the associated budget for those threats and opportunities.

During project execution, the contractor evaluates the attainment of the PMB **utilizing** their Earned Value Management System **(EVMS).**

The contractor's change control process deals with proposed scope, cost, and schedule changes by the cost account managers, as well as the work execution managers.

For potential changes within the contractor's responsibility, sometimes called trends, **the contractor will address the change as a potential variance to the work element.** This permits the condition to be highlighted and potentially mitigated.

DOE G 413.3-7A – cont'd

However, if the condition cannot be mitigated, the contractor will typically process the change and utilize MR for the change.

Typical uses of MR include funding recovery from the impacts of realized risk events, implementing and executing opportunities to accelerate remaining work in the PMB to increase confidence in schedule commitments.

MR is not used to resolve past variances (positive or negative), unless to **correct errors**, **routine accounting adjustments**, or to **improve baseline integrity and accuracy of performance measurement data**. Use of **MR should follow EVMS rules per EIA-748**D.

DOE authorization should not be required for the contractor to use MR.

However, **DOE requires contractors** subject to compliance with EIA 748D, Earned Value Management System (EVMS), **to report the use of MR as part of the monthly reporting of performance against the established PMB** (the EVMS is not required to be used for firm fixed-price contracts - DOE O 413.3B). MR should be monitored and evaluated as part of the ongoing project control and oversight functions. The use of **MR** for scope, cost and schedule mitigation **should be planned, reported, and managed over the project duration to ensure successful project completion.**

DOE G 413.3-7A – cont'd

Project and Contract Changes for Non-M&O Contracts

Changes can occur on **two levels**: changes **within** the contractor **scope** and changes **outside** the **contract scope**. Changes **within the contract scope are accomplished through the contractor's change control process**. The FPD should be cognizant of this process and the contractor's monthly status report should provide a status of executed and pending changes, as well as the status of MR utilization.

If **the contractor believes a change has occurred and the change is outside the contract scope**, the **contractor should immediately notify the Contracting Officer (CO) and the FPD in writing** in accordance with the applicable Changes clause **prescribed by the FAR and included in the contract.** If the FPD and CO concur, the FPD/CO may determine the impacted work is not necessary, and the CO will formally notify the contractor of this decision. **If the FPD/CO determine the work is necessary**, and in conjunction with the Federal Budget Officer (FBO) that funds are available (typically through the use of contingency, i.e., DOE contingency), **the CO will follow the established change control process that leads to issuing a modification to the contract**.

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If the CO, through consultation with the FPD, determine that some of the work is necessary to be executed (to preclude a stop work condition), while the contractor is preparing their proposal, **the CO may authorize a unilateral change order modification that clearly establishes a "not-to- exceed" estimate**, a definitization schedule, and the revised language for the specific change in the contract scope. **Pursuant to the modification, the contractor will prepare a proposal for that specific "changed" scope of work**, correlating what has changed from the current contract. The **contractor will also determine if** the amount of **fee is affected**. It is critical the contractor shows the correlation of the scope, cost, and schedule change to the contract, not the PMB.

The contractor's proposal will factor-in risks, just as the contractor's response to the RFP considered risks. The proposal does not show the change to the PMB. The PMB will be adjusted after the modification is finalized, just as the PMB and MR were established after the contract was awarded. When the contractor's proposal is received by the Government, the FPD/CO/FBO will evaluate the proposal and determine **if the modification has merit**. If so, **the FPD/CO/FBO will determine if contingency (i.e. DOE contingency) should be used to support the modification**.

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If the level of the scope, cost, and schedule change is within the authority of the FPD for the Project Baseline and contingency utilization, **and of the CO** to perform **the contract change, the modification is executed**. If the change is above either the FPD or CO approval authority, the change is forwarded to DOE Headquarters for approval by the Acquisition Executive and/or the Head of Contracting Authority (HCA). If approval is received, the modification is executed.

Then, the PMB is revised accordingly.