Independent Cost Review Guide

[This Guide describes suggested non-mandatory approaches for meeting requirements. Guides are not requirements documents and are not to be construed as requirements in any audit or appraisal for compliance with the parent Policy, Order, Notice, or Manual.]

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Foreword

The purpose of this *Independent Cost Review Guide* is to provide uniform guidance and best practices for use when conducting an Independent Cost Review (ICR) of a cost estimate for work planned and executed within the Department of Energy (DOE) Office of Environmental Management (EM). This Guide provides information and directions which can be used to independently examine the reasonableness of a cost estimate's quality, assumptions, and risks. This Guide applies to independent reviews of cost estimates for all phases of programs and projects executed by EM. These estimates could include estimates of capital asset life cycle management activities, operating activities, and other costs to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a system over its anticipated useful life span. These estimates encompass costs from pre-operations through operations to the end of the program/project life cycle, or to the end of the alternative.

This Guide provides a consistent approach—specifically tied to work completed under EM's mission—that supports the review and evaluation of cost estimates. This Guide does not impose new requirements, or constitute EM policy, nor is it intended to instruct cost review team members in a step-by-step manner on how to conduct an ICR. This Guide describes suggested approaches for meeting requirements.

ICRs are integrated into a number of DOE and EM requirements, policies, and procedures. The ICR is a key part of DOE and EM review and oversight functions for Capital Asset Projects (CAPs), Operating Activities, Life-Cycle Baselines, Managing the EM Cleanup Program, and useful in reasonableness determinations associated with acquisition processes. This guide incorporates policies and procedures from DOE and EM guidance documents as well as the Government Accountability Office (GAO) Cost Estimating and Assessment Guide.

This Guide is presented in two parts. Part 1 includes descriptions and purposes of an ICR, based on the types and purposes of EM cost estimates, as well as their timing relative to the Critical Decision (CD) Process. Part 2 presents best practices for performing an ICR, as well as details on practices used in the Environmental Management Consolidated Business Center (EMCBC) Office of Cost Estimating (OCE) for performing ICRs.

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1. Independent Cost Review (ICR) Guide Purpose

The purpose of this *Independent Cost Review Guide* is to provide uniform guidance and best practices for use when conducting an Independent Cost Review (ICR) of a cost estimate for work planned and executed within the DOE EM program. This Guide provides information, tools, and directions which can be used to independently examine the reasonableness of a cost estimate's quality, assumptions, and risks. This Guide applies to independent reviews of cost estimates for all phases of programs and projects executed by EM.

1.1 Introduction to this Guide

The mission of EM is to complete the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development and government-sponsored nuclear energy research. The EM program has made significant progress in shifting away from risk management to embracing a mission-completion philosophy based on reducing risk and reducing environmental liability. As an established, operating, cleanup-completion and risk-reduction program, EM is demonstrating the importance of remaining steadfast to operating principles while staying focused on the mission.[1]

The EM portfolio includes cleanup work at several DOE sites throughout the continental United States. This includes work at sites designated for closure as well as sites with continuing missions. Work includes:

- Constructing and operating facilities to treat radioactive liquid tank waste into a safe, stable form to enable ultimate disposition,
- Securing and storing nuclear material in a stable, safe configuration in secure locations to protect national security,
- Transporting and disposing of transuranic and low-level wastes in a safe and cost effective manner to reduce risk,
- Decontaminating and decommissioning facilities that provide no further value, to reduce long-term liabilities and maximize resources for cleanup,
- Remediating soil and ground water contaminated with radioactive and hazardous constituents, and
- Fulfilling its commitments to reduce risk and complete cleanup across all sites, for the generations to come.

DOE and EM are committed to making continuous improvements in contract and project management performance. EM's efforts to enhance contract and project management are focused on delivering results on time and within cost. To that end, it is critical EM develops and uses high quality cost estimates for many reasons—for example, to support decisions about funding one project over another, to develop annual budget requests, to evaluate resource requirements at key project milestones, and to develop Performance Measurement Baselines (PMBs). This Guide

[1] DOE/Office of Environmental Management, Mission, <http://energy.gov/em/mission>, (8/21/2018).

provides information and guidance which can be used to independently examine the reasonableness of a cost estimate's quality, assumptions, and risks.

1.2 Attributes of High Quality Cost Estimates

An ICR examines the following attributes associated with a cost estimate. The objective of an ICR is to provide decision-makers with an assessment of the quality of the cost estimate. Standard cost estimate attributes sought are:

- Traceable – Information is presented in a traceable fashion, containing supporting documentation and technical data. The ICR must be able to evaluate and crosswalk between all cost estimates and the scope of work the cost estimate captures.
- Reasonable – The costs presented for the scope of work, program, or item should be within the budget range for that being acquired.
- Sound – Information, assumptions, and recommendations presented within the cost estimate must be evaluated to assure they are valid. It should be sufficient regarding the cost estimating methodology rationale used in the development of the estimate. The ICR will carefully consider costs based on expert judgment and review assumptions used to develop cost estimates.
- Verifiable – Information presented must be verifiable by the ICR. The ICR will assess databases used to verify the technical parameters on the cost elements.
- Valid – Information presented must be logically correct, justifiable, and well-grounded. The ICR will review the ground rules and assumptions. The ICR will assess cost estimate components (material, labor rates, production rates, subcontract estimates, etc.) to verify reasonableness of costs used in the estimate.
- Consistent – Information presented is well organized, cohesive, supportable, and easily understood, free from errors and omissions. Costs derived using rates or units of measure for similar or like scope within the estimate should be applied in similar manner throughout the estimate.
- Complete – Information presented must contain all necessary data, assumptions, and pertinent information as it relates to the development of all costs for the scope of work estimated.

In the context of a high quality cost estimate, this means an ICR determines whether a cost estimate is:

- Credible when the assumptions and estimates are realistic; it has been cross-checked and reconciled with Independent Cost Estimates (ICEs), the confidence level associated with the point estimate has been identified, and a sensitivity analysis has been conducted.
- Well-documented when supporting documentation includes a narrative explaining the process, sources, and methods used to create the cost estimate and identifies the underlying data and assumptions used to develop the cost estimate. The estimate documentation should be traceable to original sources and easily repeatable or updated.
- Accurate when it is based on an assessment of most likely costs, adjusted properly for inflation, and contains few, if any, minor mistakes.
- Comprehensive when it accounts for all possible costs associated with a project for the level of definition, is structured in sufficient detail to ensure costs are neither omitted nor duplicated,

and has been formulated by an estimating team with composition commensurate with the assignment.

1.3 Performing ICRs

An ICR is an independent evaluation of a program/project cost estimate that examines its quality and accuracy, with emphasis on specific cost and technical risks. ICRs can be performed for cost estimates associated with EM or site programs or baselines, capital projects, or for estimates or proposals associated with EM acquisitions. Each ICR involves the analysis of the existing cost estimate's approach and assumptions.

An ICR examines the reasonableness of the cost estimate's quality, assumptions, and risks, by examining cost realism, completeness, consistency, and compliance with generally-accepted DOE and industry cost estimating processes. An ICR ensures the cost estimate is credible, well-documented, accurate, and comprehensive.

ICRs are led by a Cost Engineer or Cost Estimator and are supported by the Federal Project Director (FPD), representatives of the Integrated Project Team (IPT), and Subject Matter Experts (SMEs) who are familiar with the project technical requirements.

1.3.1 DOE O 413.3B Requirements and ICRs

DOE Order 413.3B, *Project Management for the Acquisition of Capital Assets* requires principal reviews such as ICRs, External Independent Reviews (EIRs), and ICEs at various Critical Decision (CD) stages of a DOE capital asset project. DOE project CD stages are depicted in Figure 1-1. Per the Order, for Major System Projects, an ICR will be conducted prior to CD-0. For projects with a Total Project Cost (TPC) of $100M or greater, an ICE will be developed and/or an ICR will be conducted prior to CD-1. The EM Office of Project Management (PM) decides if it will perform an ICR or an ICE for projects greater than $100M prior to CD-1.

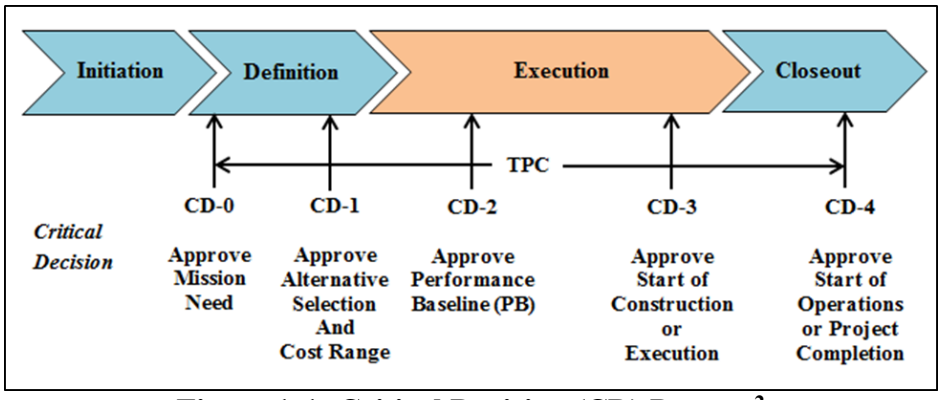

Figure 1–1: Critical Decision (CD) Process[2]

[2] DOE G 413.3-21A, Cost Estimating Guide, dated June 6, 2018, < https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-21A/@@images/file >, (8/21/2018).

The EM Office of Project Management has published *ICR and Independent Cost Estimate (ICE) Standard Operating Procedures (SOP)*. This SOP is intended to be used by PM staff and contractors in their ICR/ICE work associated with CAPs. This SOP includes policies, procedures, and best practices for ICR/ICE of EM Cleanup Work for both CAPs, operating activities, and management of the EM Cleanup Program.

1.3.2 GAO Cost Estimating and Assessment Guide and ICRs

The GAO Cost Estimating and Assessment Guide identifies eight types of Independent Cost Estimate Reviews. These are shown in the following table.

Table 1.3-1: GAO- Eight Types of Independent Cost Estimate Reviews[3]

Review	Description
Document review	An inventory of existing documentation to determine whether information is missing, and an assessment of the available documentation supports the estimate
Independent cost assessment	An outside evaluation of a program's cost estimate that examines its quality and accuracy, with emphasis on specific cost and technical risks; involves the same procedures as those of the program estimate but using different methods and techniques
Independent cost estimate	Conducted by an organization outside the acquisition chain, using the same detailed technical information as the program estimate, is a comparison to the program estimate to determine whether it is accurate and realistic
Independent government cost estimate	Analyzing contractors' prices or cost proposals, it estimates the cost of activities outlined in the statement of work; does not include all costs associated with a program and can only reflect costs from a contractor's viewpoint. Assumes all technical challenges can be met as outlined in the proposal, meaning it cannot account for potential risks associated with design problems
Non-advocate review	Performed by experienced but independent internal non-advocate staff, it ascertains the adequacy and accuracy of a program's estimated budget; assesses the validity of program scope, requirements, capabilities, acquisition strategy, and estimated life-cycle costs
Parametric estimating technique	Usually performed at the summary Work Breakdown Structure (WBS) level, includes all activities associated with a reasonableness review and incorporates cross-checks using parametric techniques and factors based on historical data to analyze the estimate's validity
Reasonableness, or sufficiency, review	A review of all documentation by an independent cost team, meeting with staff responsible for developing the program estimate, to analyze whether the estimate is sufficient regarding the validity of cost and schedule assumptions and cost estimate methodology rationale and whether it is complete

[3]GAO-09-3SP, Cost Estimating and Assessment Guide, dated March, 2009, Chapter 15, pg. 188, Table 27 < https://www.gao.gov/new.items/d093sp.pdf>, (8/21/2018).

Review	Description
Sampling technique	An independent estimate of key cost drivers of major WBS elements whose sensitivity affects the overall estimate; detailed independent government cost estimates developed for these key drivers include vendor quotes and material, labor, and subcontractor costs. Other program costs are estimated using the program estimate, if a reasonableness review was conducted to ensure their validity

As the table shows, the most rigorous independent review is an ICE. Other independent cost reviews address only a program's high-value, high-risk, and high-interest elements and simply pass through program estimate values for the other costs. While they are useful to management, not all provide the objectivity necessary to ensure the estimate going forward for a decision is valid.

1.3.3 Acquisitions Requirements and ICRs

An ICR may be performed on a DOE-developed cost estimate or contractor-developed cost estimate or proposal. FAR Part 15.407-4 states "should-cost" reviews are a specialized form of cost analysis, and the contracting officer shall consider the findings and recommendations contained in the program review team report when negotiating the contract price. This review would also support cost realism and cost reasonableness activities.

Cost Realism is a key criterion in examining the reasonableness of a cost estimate's quality, assumptions, and risks primarily related to EM acquisitions. The Federal Acquisition Regulation (FAR) (FAR 2.101) describes cost realism as the state where the costs in an offeror's proposal are realistic for the work to be performed, reflect a clear understanding of the requirements, and are consistent with the various elements of the offeror's technical proposal. The FAR 15.305 Proposal Evaluation directs that when contracting on a cost-reimbursement basis, evaluations shall include a cost realism analysis to determine what the Government should realistically expect to pay for the proposed effort, the offeror's understanding of the work, and the offeror's ability to perform the contract.

1.4 ICR Uses Described in this Guide

This Guide describes ICRs for various purposes, intended uses, and types of cost estimates. The reviewer or team conducting an ICR must ensure the cost estimate is credible, well-documented, accurate, and comprehensive, regardless of the estimate's purpose, use, or type.

1.4.1 Internal Peer Review Through an ICR

An internal peer review is performed on every EMCBC OCE-developed cost estimate. For the intent and purpose of this Guide, an internal peer review of an OCE developed estimate could be considered an ICR. The process used by the OCE to perform internal peer review to ensure high quality cost estimates are being developed has the same focus and purpose of an ICR - to examine the reasonableness of the cost estimate's quality, assumptions, and risks.

Internal peer reviews are conducted on every IGCE or ICE developed by the EMCBC OCE for the purpose of maintaining a high quality standard for deliverables from the Office. Internal peer reviews are conducted by senior level cost estimators or cost engineers prior to approval by the Assistant Director of the OCE. The process described in this Guide is followed in the internal peer review.

1.4.2 ICR of a Cost Estimate used in Developing a CPB

An ICR is performed on a contractor-generated cost estimate before a Contractor's Performance Baseline (CPB) is approved. The CPB represents the performance plan against which the contractor is measured, as the contractor executes the total contract scope of work.

An ICR of a contractor-generated cost estimate used in the development of a CPB supports the management and maintenance of a CPB. The purpose of an ICR of a cost estimate developed for a CPB is the same as the purpose of an ICR of a cost estimate in general.

1.4.3 ICR of a Contract Post-Award Action

When a contract post-award action is necessary, a Contracting Officer (CO) has exclusive authority to issue changes and modify contracts. It is critical the FPD and the CO ensure contract changes are identified, issued, administered, and managed in a timely manner over the life of the project and contract.

The CO may issue a unilateral or bilateral change to a contract that may result in a contractor-generated cost estimate supporting a Request for Proposal (RFP), Request for Quotation (RFQ), or Request for Information (RFI).

In addition, as projects evolve, baselines are established, and changes are managed against those baselines. Cost estimates supporting proposed changes should contain the same level of quality as the primary baseline cost estimate. Any change must follow the appropriate baseline configuration management process, and an ICR of a cost estimate prepared to support the change could be required.

A contractor-requested post-award change such as a Baseline Change Proposal (BCP) or Request for Equitable Adjustment (REA) may require the need for an ICR when the cost exceeds the Simplified Acquisition Threshold (SAT). Within EM, in accordance with HCA Directive 2.0, *Independent Government Cost Estimates*, an Independent Government Cost Estimate (IGCE) shall be prepared and furnished to the CO at the earliest practicable time for each proposed contract action anticipated to exceed the SAT. The CO determines whether an ICR is required.

Whether the contract modification is a directed change, or is contractor-requested, a cost reasonableness review of the cost estimate or proposal is accomplished with an ICR.

2. Independent Cost Review (ICR) Practices

The Office of Project Management conducts EIRs, ICRs, and ICEs as required by DOE O 413.3B. The Standard Operating Procedure (SOP) document used by that office, *Independent Cost Review*

(ICR) and Independent Cost Estimate (ICE) Standard Operating Procedures (SOP) Revision 2, dated February 10, 2016 provides guidance for performing ICRs. This Guide is a compilation of best practices from that SOP and from other sources.

Figure 2-1 depicts the simplified ICR process. ICR duration, and the ICR process used, will vary from project to project, and will depend on the scope, size, and complexity of the project.

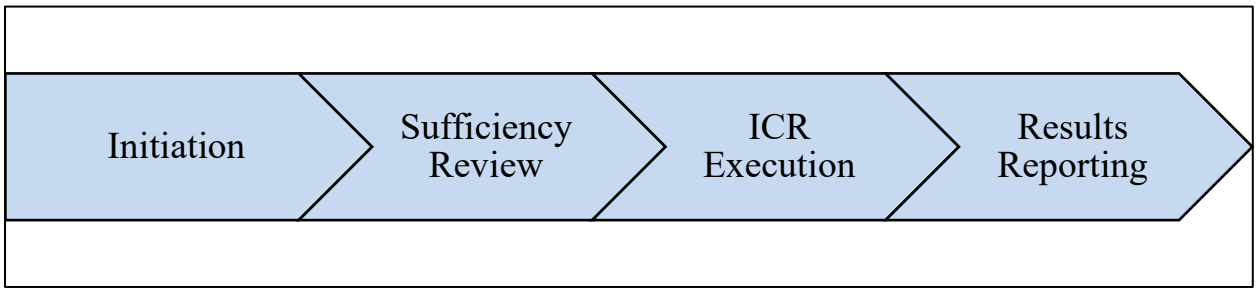

Figure 2–1: Simplified ICR Process

The ICR process always includes the following phases and activities:

- ICR Initiation – Accept ICR scope, plan ICR, request/receive program documents, hold kickoff meeting (if necessary)
- ICR Sufficiency Review – Evaluate program documents, determine whether the amount of documentation is sufficient to perform the ICR
- ICR Execution – Review additional documents, conduct desktop or on-site cost validation, complete document review, conduct out-brief (if necessary)
- ICR Results Reporting – Draft ICR Report, review factual accuracy, present briefings, resolve issues, write ICR Report

2.1 ICR Initiation

The ICR Initiation phase begins with a request for an ICR. An ICR request may come from a Federal Project Director (FPD), a Project Management Support Office (PMSO), or Program Manager (if no PMSO exists). It may also be made by a contracting officer, peer cost engineer/estimator, individuals involved in EM environmental liability estimates or in general, an ICR request may be made by a person with program, project, or contract responsibility. An ICR request should define the scope, bounds, and objectives of the cost review to be conducted.

As detailed in Section 1 of this Guide, ICRs have many purposes. An ICR must be performed by an independent source who is not affiliated with the program, project, or contract. When qualified independent cost estimating professionals are not available within the EM program or project office, the Environmental Management Consolidated Business Center (EMCBC) Office of Cost Estimating (OCE) should be contacted to perform an ICR. The EMCBC OCE has a staff of cost estimating subject master experts (SMEs) who can either perform an ICR or support larger teams during the planning and execution of any required ICR.

Once the ICR request is initiated an ICR Team Lead is assigned. The ICR Team Lead assumes responsibility to Lead the ICR Team in all aspects of the review including:

- Planning and coordinating the review,
- Developing the review plan including establishing an overall schedule with interim milestones,
- Leading the ICR scoping meeting and finalizing the review plan,
- Identifying the resources needed to complete the ICR and meet requestor requirements,
- Making team assignments,
- Providing guidance to the team on conducting ICR, scope, and schedule,
- Conducting regular progress meetings with Team as the ICR progresses,
- During on-site portions of review lead daily meetings to discuss Findings, Recommendations, and Observations,
- Conducting a closeout briefing at conclusion of the site visit,
- Writing a Report, and
- Follow-up on completion and close-out of each action on the corrective action plan.

The ICR Team Lead ensures the program/project team is aware they must provide the substantial documentation required to support an ICR. Insufficient documentation is a major contributor to both schedule delays and less-than-optimum ICR results. Readiness of the project documentation is a critical item in the planning; incomplete or late information will jeopardize an ICR schedule.

The lead reviewer conducting an ICR requests and receives information necessary to start the cost review. This documentation includes the following information:

- Statement of Work (SOW), and supporting scoping documents (RFPs, RFQs, RFIs, drawings, plans)
- DOE-developed cost estimate (IGCE/ICE), or contractor cost proposal and technical approach
- Basis of Estimate (BOE)

Estimate documentation includes a complex package related to the estimate. When prepared correctly, an experienced person can use information in the estimating package to understand and assess the estimate, independent of any other supporting documentation. An independent reviewer can establish a full understanding of the estimate including the cost associated with the technical approach used as the basis for the estimate and can recreate the estimate or make adjustments based on the details in this documentation.

The BOE is a key part of the cost estimate documentation. The BOE is prepared by the estimating team and provided to the ICR team. The BOE should be sufficiently completed and well organized such that a cost estimating professional can use the documentation by itself to understand and assess the estimate. The Association for the Advancement of Cost Engineering International (AACE) under the Total Cost Management (TCM) framework identifies a basis of estimate (BOE) document as a required component of a cost estimate. The BOE is characterized as the one deliverable that defines the scope of the project, and ultimately becomes the basis for change management. A well-written BOE achieves the goals associated with a high quality estimate by

clearly and concisely stating the purpose of the estimate being prepared (i.e., cost study, project options, funding, etc.), the project scope, pricing basis, allowances, assumptions, exclusions, cost risks and opportunities, and any deviations from standard practices. In addition, the BOE is a documented record of pertinent communications that have occurred and agreements made between the cost estimator and other project stakeholders. The BOE establishes the context of the estimate and supports review and validation. See EM-CE&A G 002, Cost Estimate Development Handbook; DOE G 413.3-21, DOE Cost Estimating Guide; GAO Cost Estimating and Assessment Guide, for additional guidance in what constitutes an effective BOE.

Other documentation or information useful in performing an ICR is as follows:

- Proposal Narrative, including background
- Estimate Plan
- Work Breakdown Structure (WBS) and WBS Dictionary
- Project Schedule
- Risk Management Plan
- Rates for fee or other mark-ups with source information
- Lists of government-furnished property, equipment, or services
- Cost estimate back-up documentation such as contracted labor rates and associated mark-ups, subcontracted quotes, specification sheets, purchase orders, and catalog cut sheets

2.2 ICR Sufficiency Review

After receipt of all project documentation, the reviewer or team performs a Sufficiency Review to verify the project documentation is adequate for detailed cost review. The Sufficiency Review achieves the following functions:

- Examines the cost estimate to ensure it meets the technical requirements for its intended purpose
- Determines whether the cost estimate is clearly documented, well organized, and presented at an appropriate level of detail, and summary documents are traceable to the supporting documentation (The EMCBC OCE utilizes a Peer Review Checklist that defines standards for reviewing a cost estimate. See Appendix F).
- Looks at the depth and breadth of the supporting documents, and data contained therein

As a result of the Sufficiency Review, it may be determined certain documentation is insufficient for proceeding with an ICR. When this occurs, the reviewer or team notifies the requester, provides a list of the documents that are insufficient, and provides reasons for the finding or specific information needed for the document to be acceptable.

2.3 ICR Execution

The ICR may be conducted off-site or, depending on the complexity of the ICR may require an on-site review which the ICR Team lead will coordinate. The ICR Execution generally is performed in two parts: the ICR Review and the ICR Validation.

The ICR Review is typically qualitative in nature and serves as a quality assurance and control function. The focus of the ICR Review is to ensure the cost estimate technically meets requirements, meaning the cost estimate was developed using contractually or procedurally required practices, tools, and data; it covers the entire project scope; it is free from error and omissions; and it is structured and presented in the expected format.

It is EM Policy that all estimates prepared for EM work be developed using the "12-steps" to develop high quality estimates as detailed in the GAO Cost Estimating and Assessment Guide. During the Review, the following table can be referenced to determine how well the cost estimate was developed per the specific 12 steps of a High Quality Estimate according to the GAO.

Table 2–1: GAO 12-Steps to High Quality Estimate

GAO Cost Estimating & Assessment Guide (GAO-09-3SP): 12-Steps to High Quality Estimate	
1	Define estimate's purpose
2	Develop estimating plan
3	Define program characteristics
4	Determine estimating structure
5	Identify ground rules and assumptions
6	Obtain data
7	Develop point estimate and compare it to an independent cost estimate
8	Conduct sensitivity analysis
9	Conduct risk and uncertainty analysis
10	Document the estimate
11	Present estimate to management for approval
12	Update the estimate to reflect actual costs and changes

The ICR Validation is typically quantitative in nature and focused on ensuring the cost estimate meets the project expectations and requirements regarding its appropriateness, competitiveness, and to identify improvement opportunities. One or more cost validation techniques are used to validate the estimate.

Both parts of ICR Execution contain areas of interest derived from EM's Project Definition Rating Index (PDRI), a modification of a commercially developed planning tool, for use in EM projects. These areas of interest are referred to as Lines of Inquiry (LOI). EMCBC has adapted EM's PDRI into checklist format, for improved usability. The Cost section of this version is included as an appendix (Appendix D) to this Guide.

2.3.1 ICR Review

The ICR Review entails a review and qualitative analysis of the SOW, the DOE-developed cost estimate or contractor-developed cost estimate or proposal, and the BOE. Tables 2-1, 2-2, 2-3, and 2-4 describe the steps conducted and some potential questioning or lines of inquiry to use to achieve the objectives of the ICR Review.

Table 2–2: ICR Review of the Scope of Work

Identify and review the Scope of Work.
Does the Scope of Work appropriately define the effort of the program or project?
Is the scope of work commensurate with the planning phase size and complexity of the project?
Is the scope of work deliverables-based? That is, does it state the deliverables that will occur in the project to the most practical extent?
In the case of a contractor proposal, was a WBS dictionary developed, and is it consistent with the solicitation or RFP Scope of Work?

Table 2–3: ICR Review of the Cost Estimate or Proposal (Administrative Information, and Estimate Documentation)

Review the administrative information and overall documentation for the cost estimate or proposal.	
Is the administrative information appropriate?	
	Who prepared the cost estimate and what are their qualifications?
	For what purpose was the cost estimate generated?
	Is this cost estimate a new estimate or an update of a prior estimate?
	Was a peer review conducted?
	Has the cost estimate been previously reviewed, and if so, what were the Findings and Observations?
Is the cost estimate documented appropriately?	
	Is the cost estimate prepared in accordance with DOE requirements?
	Is the cost estimate documented clearly?

Review the administrative information and overall documentation for the cost estimate or proposal.	
	Are the summary and detail pages well organized and presented at an appropriate level of detail?
	Is the level of detail sufficient to ensure the project scope is accurately reflected in the cost estimate?
	Is every cost appearing on the cost estimate summary traceable to the cost estimate detail and other cost estimate backup documentation?
Does the cost estimate's BOE provide a WBS and is it used in the estimate?	
	Does the WBS (and WBS dictionary if included) incorporate all project work scope?
	Is the WBS workable or desirable in terms of executing the project in a logical and efficient manner?

Table 2–4: ICR Review of Cost Estimate or Proposal (Methodology, Arithmetic, and Reasonableness)

Analyze the cost estimate or proposal.	
Examine the cost estimating methodology used in preparing the estimate or proposal.	
	What methodology was used to prepare the cost estimate?
	Is the methodology employed appropriately, based on cost estimate class and purpose, available technical information, time constraints, and compliance with planning and project type, size, and complexity?
	Does the methodology facilitate systematic cost estimate duplication or verification, that is, can the ICR "replicate" what was done in the cost estimate from the documentation?
	If the Historical Basis Method was used, is the data normalized to account for variables such as inflation, location, seasonality, or labor? For example, are those costs adjusted to current year dollars to account for inflation?
Is the cost estimate arithmetically correct?	
	Do cost summary tables (numeric tables) exist, mapping to the established WBS, at the right level of detail, and with appropriate supporting narrative?
	Are all formulas, subtotals, and totals correctly calculated? Do the calculations double count? Are all costs accounted for?

Analyze the cost estimate or proposal.	
	Does the cost estimate roll up in a logical fashion, with appropriate application of site and project-specific indirect costs?
	If the performance period for the work scope spans multiple years, are the estimated costs time-phased?
Is the cost estimate reasonable?	
	Are the costs presented for the scope of work, program, or item within the budget range for that being acquired?
	Is the cost estimate logical? Does it make sense in the context of the product or service being estimated?
	Does the cost estimate display a bias toward being too low or too high? If so, how does the cost estimate reflect this bias?

Table 2–5: ICR Review of the BOE

Read and assess the BOE.	
Is the BOE well organized and complete?	
Does the BOE provide the design basis, planning basis, cost basis, and risk basis of the cost estimate?	
Assess the design basis:	
	Are all scope assumptions acknowledged?
	Are all estimate exclusions or qualifications clearly documented?
	Are all engineering deliverables used in developing the cost estimate identified?
Assess the planning basis, which includes the schedule, resource plan, and construction plan:	
	Is the planning basis reasonable?
Assess the cost basis, and review the source of and documentation for material prices, labor rates, and labor productivities:	
	Are the prices, rates, and productivities reasonable, in line with expectations, and consistently applied throughout the cost estimate?
Assess the risk basis. If applicable:	

Read and assess the BOE.	
	Is the risk basis clearly defined?
	Is the risk basis reasonable for the level of information available to prepare the cost estimate?

2.3.2 ICR Validation

As the objectives of the ICR Review are met, ICR Execution moves to ICR Validation. ICR Validation is testing a cost estimate to see whether it is reasonable and includes all necessary costs. There are several commonly-accepted cost validation techniques. The reviewer or team, based on the nature of the project, will select the appropriate technique or techniques for performing the ICR Validation.

One technique employed in ICR Validation is spot checking the cost estimate. This check can be performed by selecting significant tasks and validating their associated costs. Checking every task is not essential. Tasks with significant costs can be identified by applying the Pareto Principle (The 80/20 Rule), which states approximately 80 percent of a project's cost is contained in 20 percent of its tasks. Because significant tasks account for most of the project cost, they receive prime emphasis and effort.

Components of the significant cost items identified for validation are listed below. These components are evaluated for reasonableness.

- Labor rates and hours
- Labor and crew composition
- Production rates
- Material costs
- Equipment usage and rates
- Quantity development
- Unit cost modifiers or adjustments
- Direct cost markups

Benchmarking is performed to ensure key metrics from the cost estimate are in line with the same metrics from similar completed projects. Comparison metrics may include values such as percent of administration (home office) costs, percent of engineering/design costs, equipment to total field cost ratios, equipment to TPC ratios, cost per piece of equipment, labor hours per piece of equipment, and cost-to-plant capacity ratios ($/megawatt-hour, $/square foot). Sometimes the metrics will be generated down to the discipline level, where ratios such as cost per diameter inch of piping, cost per cubic yard of concrete, and cost per ton of steel are evaluated.

Data used in benchmarking may include third party published data from similar completed projects in the public domain (acceptable), similar completed projects from site historical data (desired),

data from EM's Environmental Cost Analysis System (ECAS), or past detailed cost estimates (not recommended, but allowable if those estimates were updated to reflect actual project experience).

If there is a large discrepancy in benchmarking, it must be explained by the circumstances of the estimated project versus similar projects.

Another good practice for estimate validation is preparing a check estimate, using order-of-magnitude estimating methods, or using conceptual estimating techniques. If there are significant differences between the elements of the check estimate and the cost estimate being reviewed, the differences should be able to be explained by the peculiarities of the project. These differences may indicate the need for a more thorough examination of the cost estimate detail.

2.4 ICR Results Reporting

The final phase of the ICR process is ICR Results Reporting. During this phase, the reviewer or team generates an ICR Report. This report identifies any Findings and Observations that will provide DOE decision-makers with an assessment of the quality of a DOE-developed cost estimate or contractor-developed cost estimate or proposal.

A sample ICR Report is included as an appendix to this Guide. This sample illustrates the process of a typical ICR and ICR Results Reporting following the direction provided in this Guide. This sample is adapted from an ICR Report completed prior to the establishment of this Guide, and adjustments were made to reflect recommendations in this Guide.

2.4.1 ICR Findings and Observations

The ICR Report lists Findings discovered during an ICR. Findings reflect deficiencies in the desired attributes appearing in Section 1.2 of this Guide. Findings must be addressed or corrected by the cost estimate author prior to use of the cost estimate or proposal. Findings may include deficiencies such as:

- Major work scope omitted
- Quantities developed are inconsistent with technical requirements
- Cost estimate peer review was not conducted by site/project technical team
- Appropriate estimate metrics were not used to validate cost estimate during peer review
- Qualitative or quantitative deficiencies are present that affect the usefulness of the cost estimate or proposal
- Cost estimate detail is not traceable to the summary costs

The ICR Report also lists Observations discovered during an ICR. Observations are items of note within the cost estimate or proposal. Observations are provided for consideration and possible revision to the cost estimate author, to improve the quality of the cost estimate or proposal but are not required to be acted on. Observations may include items of note such as:

- Ground rules or assumptions are missing
- Markups, such as sales tax or escalation rates, are incorrect

Escalation is defined in the Glossary of Terms in this Guide. In the context used, the reviewer should ensure economic escalation is properly and realistically reflected in the cost estimate. Escalation is schedule driven, and scheduling assumptions need to be clearly noted. NOTE: Project teams may use specific rates relative to the site when available. In any case, the source of escalation information used should be identified and the applicability of the rates should be explained/justified.

2.4.2 ICR Report Content

The ICR Report conveys the results of an ICR, documenting and communicating Findings and Observations. If there are no Findings or Observations, this fact is documented and communicated as well. The report must stand alone and clearly define any facts learned in the process of an ICR.

An ICR Report contains, at a minimum, the following sections along with their supporting information:

- Executive Summary
- ICR Overview
  - ICR Purpose
  - ICR Team Composition
  - ICR Key Evaluation Criteria
  - ICR Methodology used in the Validation Phase
- ICR Assessment
  - Listing of estimate categories assessed
  - By category:
    - Findings
    - Observations
- Conclusion

Once completed, an ICR Report goes through a peer review within the OCE team followed by approval of the Assistant Director of the OCE. The complete, reviewed, and approved ICR Report is then provided to the requester.

ICR's conducted as part of the DOE O 413.3B processes should include:

- Executive Summary
- Background (including project cost/baseline history)
- Scope of Work and respective Key Performance Parameters
- Cost Estimating Process
- Basis of Estimate
- Schedule
- Risks
- Summary of Findings
- Recommendations

Once completed, the Project Team, Program Office, and other stakeholders should be provided an opportunity to correct any factual errors or misrepresentations in the Draft report or to provide any additional information that may be required. Unless the ICR Team considers the corrections to any factual errors or misrepresentations to be material to its findings, the findings and recommendations in the Final report should be essentially the same as those in the Draft report.

Formal transmittal of the final ICR report will be from the Director, Project Management Oversight and Assessments (PM-1) to the appropriate Deputy Administrator (DA) or PSO.

Appendix A Acronyms used in this Guide

AACE	Association for the Advancement of Cost Engineering
BCP	Baseline Change Proposal
BOE	Basis of Estimate
CAP	Capital Asset Project
CD	Critical Decision
CO	Contracting Officer
CPB	Contract Performance Baseline
DA	Deputy Administrator
DOE	Department of Energy
ECAS	Environmental Cost Analysis System
EIR	External Independent Review
EM	DOE Office of Environmental Management
EMCBC	Environmental Management Consolidated Business Center
FAR	Federal Acquisition Regulation
FCD	Federal Cleanup Director
FPD	Federal Project Director
GAO	Government Accountability Office
IBCR	Independent Baseline and Cost Reviews
ICE	Independent Cost Estimate
ICR	Independent Cost Review
IGCE	Independent Government Cost Estimate
IPT	Integrated Project Team
KD	Key Decision
KPM	Key Performance Measure
LCB	Life-Cycle Baseline
LOI	Lines of Inquiry
OAM	Operations Activity Manager
OCE	EMCBC Office of Cost Estimating
PBS	Program Baseline Summary
PDRI	Project Definition Rating Index
PM	DOE Office of Project Management
PMB	Performance Measurement Baseline
PMSO	Project Management Support Office
REA	Request for Equitable Adjustment
RFI	Request for Information
RFP	Request for Proposal
RFQ	Request for Quotation

SAT	Simplified Acquisition Threshold
SME	Subject Matter Expert
SOP	Standard Operating Procedure
SOPP	Standard Operating Policy or Procedure
SOW	Statement of Work
TCM	Total Cost Management
TPC	Total Project Cost
WBS	Work Breakdown Structure

Appendix B Glossary of Terms

Assumptions – Factors used for planning purposes considered true, real or certain. Assumptions affect all aspects of the planning process and of the progression of the project activities. (Generally, the assumptions will contain an element of risk.)

Baseline – A quantitative definition of cost, schedule, and technical performance that serves as a base or standard for measurement and control during the performance of an effort; the established plan against which the status of resources and the effort of the overall program, field program(s), project(s), task(s), or subtask(s) are measured, assessed, and controlled. Once established, baselines are subject to change control discipline.

Basis of Estimate (BOE) – A part of a Cost Estimating Package or stand-alone document supporting a cost estimate. The BOE should describe the design basis, the planning basis (significant features and components, proposed methods of accomplishment, and proposed project schedule), the risk basis, supporting research and development requirements (important when new technologies are contemplated for certain components, equipment, or processes), special construction or operating procedures, site conditions, the cost basis, and any other pertinent factors or assumptions that may affect costs.

Confidence (confidence level) – The likelihood – expressed as a percentage – that an occurrence will be realized. The higher the confidence level, the higher the probability the event will occur. For cost estimating, CL is the probability a cost estimate or schedule can be achieved or bettered. One of the outputs of a Monte Carlo simulation is a cumulative probability distribution which allows one to determine the associated cost or duration for a given confidence level.

Contract Budget Base (CBB) –The sum of the Performance Measurement Baseline plus the contractor Management Reserve. (CBB = PMB + MR). Should be the same as the sum of the negotiated contract cost (NCC) and AUW. Note: When the contract is awarded, the CBB is the total estimated contract cost. In project terms the contract budget base is performance measurement baseline plus contractor management reserve. If the Contracting Officer issues a change to the contract which adds additional scope/ requirements and associated costs, the CBB is increased to add the costs for contract change once the Contracting Officer issues the modification to change the contract. If the Contracting Officer issues an undefinitized contract modification [authorized unpriced work], then the CBB is increased to include the costs associated with the contract change. The CBB is not increased by the amount of a cost overrun that has been negotiated by the Contracting Officer. The CBB is no longer the same as the total estimated cost of the contract once there is an Over-Target Baseline (OTB).

Contract Performance Baseline (CPB) – The Contract Performance Baseline represents the cost, schedule, and scope as it relates to the total estimated cost of the contract exclusive of fee for the work scope and performance period being authorized. The CPB includes all work identified in the contract (including work defined as Capital Asset under DOE O 413.3B and work defined as Operations Activities under DOE EM policies and guidance, (Contract scope, CBB, schedule, deliverables, and contract end date).

Cost Estimating – A process used to quantify, cost, and price the resources required by the scope of an asset investment option, activity, or project. As a predictive process, estimating must address risks and uncertainties. The output of estimating is used primarily as input for budgeting, cost or

value analysis, decision making in business, asset and project planning, or project cost and schedule control.

Direct Cost – Costs identified with a particular project or activity; includes salaries, travel, equipment, and supplies directly benefiting the project or activity.

Escalation – The provision in actual or estimated costs for an increase in the cost of equipment, material, labor, etc., due to continuing price level changes over time. Inflation may be a component of escalation, but non-monetary policy influences, such as supply-and-demand, are often components.

Estimate –The assessment of the most likely quantitative result. (Generally, it is applied to costs and durations with a confidence percentage indication of likelihood of its accuracy.)

Independent Cost Estimate (ICE) – A cost estimate prepared by an organization independent of the project sponsor, using the same detailed technical and procurement information to make the project estimate. It is used to validate the project estimate to determine whether it is accurate and reasonable.

Independent Cost Review (ICR) – An independent evaluation of a project's cost estimate that examines its quality and accuracy, with emphasis on specific cost and technical risks. It involves the analysis of the existing estimate's approach and assumptions.

Independent Government Cost Estimate (IGCE) – The government's estimate of the resources and projected costs a contractor would incur in the performance of a contract. These costs include direct costs such as labor, supplies, equipment, or transportation and indirect costs such as labor overhead, material overhead, as well as general and administrative expenses, profit, or fee.

Indirect Cost – Costs incurred for common or joint objectives which cannot be identified with a particular activity or project.

Inflation – The proportionate rate of change in general price as opposed to the proportionate increase in a specific price.

Integrated Project Team (IPT) – A cross-functional group of individuals organized for the specific purpose of delivering a project to an external or internal customer. It is led by a Federal Project Director. The IPT is accountable for planning, budgeting, procurement, and life-cycle management of the investment to achieve its cost, schedule, and performance goals. Team skills include budgetary, financial, capital planning, procurement, user, program, architecture, earned value management, security, and other staff as appropriate.

Life Cycle – A complete array of stages that comprise an asset's period of existence including planning through acquisition, operation, maintenance, remediation, long term stewardship, and disposition. See life-cycle cost analyses.

Life Cycle Cost Estimate (LCCE) – A documented statement of costs to be incurred to complete all stages of a project from planning through acquisition, maintenance, operation, remediation, disposition, long-term stewardship, and disposal. The results of a LCCE showing the total cost to the Government of acquiring, operating, supporting, and (if applicable) disposing of the items being acquired. The sum total of all direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the planning, design, development, procurement, production, operations and maintenance (periodic or continuing), support, recapitalization, and

final disposition of real property over its anticipated life span for every aspect of the program, regardless of funding source.

Risk – Factor, element, constraint, or course of action that introduces an uncertainty of outcome, either positively or negatively that could impact project objectives. This definition for risk is strictly limited as it pertains to project management applications in the development of the overall risk management plan and its related documentation and reports.

Scope – The sum of all that will be or was invested in and delivered by an activity or project. In project planning, the scope is usually documented (i.e., the scope document), but it may be verbally or otherwise communicated and relied upon. Generally limited to that which is agreed to by the stakeholders in an activity or project (i.e., if not agreed to, it is out of scope.). In contracting and procurement, scope includes all an enterprise is contractually committed to perform or deliver.

Statement of Work (SOW) – A narrative description of contracted products or services.

Total Project Cost (TPC) – All costs between CD-0 and CD-4 specific to a project incurred through the startup of a facility but prior to the operation of the facility. Applicable costs to achieve CD-0 may also be included. Thus, TPC includes the total estimated cost and fee for all contracts included in the project and may include Government prime contracts for external independent review, technical support services, and other prime Government contracts for components of the projects. TPC is the summation of TEC plus OPC, as well as the summation of the PMB + MR + contingency + profit/fee + other DOE costs.

Work Breakdown Structure (WBS) – Product-oriented grouping of project elements that organizes and defines the total scope of the project; a multi-level framework that organizes and graphically displays elements representing work to be accomplished in logical relationships. Each descending level represents an increasingly detailed definition of a project component. Components may be products or services. The structure and code that integrate and relate all project work (technical, schedule, and cost) and are used throughout the life cycle of a project to identify and track specific work scope. Note: WBS should not be developed or organized along financial or organizational lines. It should be broken into organized blocks of work scope, and scope related activities. Financial and/or organizational identification needs should be attached as separate codes that relate to the WBS element.

Appendix C General References

SOPP # 96 Rev 0 Performing Cleanup Program Independent Baseline and Cost Review (IBCR)

DOE/Office of Project Management and Assessments (PM) *Independent Cost Review (ICR) and Independent Cost Estimate (ICE) Standard Operating Procedures (SOP) Revision 2*, dated February 10, 2016

DOE O 413.3B, *Program and Project Management for Acquisition of Capital Assets*, Change 4 dated 10-13-2017

GAO-09-3SP, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, dated March 2, 2009

Appendix D PDRI – Cost Lines of Inquiry (LOIs)

This file excerpt is from the EMCBC-adapted version of the EM Project Definition Rating Index (PDRI).

Master EM Project Definition Rating Index – Cleanup and Disposition Project Definitions

Rating Element		Criteria for Maximum Rating
COST		
A1	Cost Estimate	• A cost estimate was developed and formally approved by FPD and is the basis for the cost baselines. • The cost estimate is within the parameters of the IGCE and covers all phases of the project. • The estimate is prepared in accordance with DOE requirements. • The estimate bases are fully documented and traceable. • Supporting backup information was collected and organized and is available in a central file or location. • Major estimate assumptions, especially those affecting major cost drivers, are fully documented and explained. • Estimate exclusions or qualifications are clearly documented. • Estimated costs are time-phased.
A2	Cost Risk/ Contingency Analysis	• The cost estimate includes contingency allowances developed in accordance with DOE guidance. In addition to any deterministic contingency analyses that may have been developed, a probabilistic risk analysis was performed. • The assumptions, rationale, and methodology used to perform the probabilistic analysis are explained. • The cost risk analysis builds on and is tied to the Project Risk Management Plan. • Risk mitigation costs, if appropriate, were included in the baseline cost estimate, or addressed by the risk analysis model. • Costs related to schedule contingency are also included. • Management reserve was quantified. • The confidence level of the baseline cost estimate is clearly stated and explained. All the preceding requirements are documented in the project record. • Risk mitigation activities should be included in the cost estimate.

Rating Element		Criteria for Maximum Rating
A3	Funding Requirements/ Profile	• Funding requirements were defined and the project timeline is in compliance with the DOE budget timeline/process. • Required budget documentation, including Project Data Sheets (where required), reflects current project cost and schedule estimates/forecasts. • The funding profile is time-phased through integration with the project baseline schedule. • Resource constraints (personnel, budget authorizations, etc.) were considered when developing the project schedule, and an iterative process used to correlate the cost estimate, schedule, and funding profile. • The funding profile is based on full consideration of available or expected budget or funding levels for the project.
A4	Independent Cost Estimate/Schedule Review	• In addition to any internal cost and schedule estimate reviews, the cost estimate and schedule were subjected to an independent review by an organization not directly involved with the project (ICE, as required). • The independent review was documented, including the techniques used and type of review performed. • The results, findings, and recommendations of the independent review were reconciled with the cost and schedule estimates and changes were incorporated.
A5	Life Cycle Cost	• Project Life Cycle Costs (LCC) includes relevant assumptions, bases of estimate, qualifications, and exclusions. • LCC includes the estimated cost for government commitments that result from execution of this project, including downstream projects/facilities and eventual disposition of the facilities constructed for this project. • LCC Savings were clearly identified.
A6	Forecast of Estimate at Completion (EAC)	• The cost baseline is approved, and the measurement of actual performance begun, forecasts of estimate at completion (actual costs to-date plus “to-go” costs) were developed and issued at regular intervals. • Cost forecasts were developed in accordance with project procedures. • Key assumptions supporting the baseline estimate were periodically re-evaluated and the impacts of changing assumptions were reflected in the estimates of “to-go” costs. • Forecasts were related to the Change Control system and incorporate both approved and pending changes, as appropriate. • The forecast of cost at completion is a reasonable projection based on the status of the project and experience to-date.
A7	Cost Estimate for Next Phase of Work	• A detailed cost estimate was prepared and approved for the work scope to be accomplished during the next phase of the project (i.e., the efforts needed to successfully complete the prerequisites for the next Critical Decision). • Cost estimates are defensible with an appropriate level of supporting detail and documentation. • Assumptions are clearly stated and documented.

Appendix E ICR Report Sample

Independent Cost Review
of the DOE Contractor Estimate
for RCRA Compliant Cell
in Area 5_S/C Nevada National Security Site

Prepared for

Office of Contracting, Nevada National Security Site (NNSS)

by

Environmental Management Consolidated Business Center
Office of Cost Estimating and Project Management Support
(EMCBC OCE&PMS)

July 14, 2009

Title and Approval Page

Document Title: Independent Cost Review of the DOE Contractor Estimate for RCRA Compliant Cell in Area 5_S/C Nevada National Security Site

Publication Date: July 14, 2009

Prepared for: Office of Contracting, Nevada National Security Site

Prepared by: Environmental Management Consolidated Business Center (EMCBC)
Office of Cost Estimating & Project Management Support (OCE&PMS)

Approved by

Author: <enter typed author name and title>

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Author: < enter typed author name and title>

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Reviewed by: < enter typed reviewed by name and title>

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at the Direction of: This document prepared at the direction of the Assistant Director,
Environmental Management Consolidated Business Center,
Office of Cost Estimating & Project Management Support

Table of Contents

1. Executive Summary

Environmental Management Consolidated Business Center (EMCBC) Office of Cost Estimating and Project Management Support (OCE&PMS) conducted an Independent Cost Review (ICR) of Department of Energy (DOE) Contractor Estimate for a Resource Conservation and Recovery Act (RCRA) Compliant Cell in Area 5_S/C Nevada Nuclear Security Site (NNSS) under contract. The objective was to perform and document an ICR of the DOE Contractor Estimate to provide Environmental Management (EM) decision-makers with an assessment of the quality of the cost estimated for this effort. The ICR included an evaluation and review of the estimate for construction of a RCRA Compliant Disposal Cell, 150 ft. wide x 300 ft. long x 20 ft. deep.

This report documents the purpose, scope, cost review strategy, assumptions, methodology, Findings and Observations of the ICR. This document was prepared in accordance with guidance in DOE Cost Estimating Guide 413.3-21, and the policies and practices of EMCBC OCE&PMS.

Based on the review of the DOE Contractor Conceptual Design Report for the Waste Disposal Facility, and an analysis of the estimate for the work, the DOE Contractor Estimate was found to be valid and reasonable.

The ICR Team did make some Observations during the ICR process. These Observations are discussed further in Section 3 of this document.

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2. Independent Cost Review (ICR) Overview

2.1. ICR Purpose

An ICR is a thorough review of the contractor's estimate, supporting documentation, and associated work packages for cost realism, reasonableness, completeness, consistency, and compliance with generally accepted DOE and industry cost estimating processes.

In support of the EMCBC Office of Contracting, the EMCBC OCE is designated as the lead for completion of an ICR for all contractor estimates to support contract actions. The Nevada National Security Site (NNSS) Office of Contracting requested the ICR of the DOE Contractor Estimate. This ICR of the DOE Contractor Estimate will serve to provide decision-makers with an assessment of the quality of the cost estimate associated with the RCRA cell work.

Conducting an ICR of a contractor-developed estimate is crucial to establishing confidence in the estimate and verifies realism, completeness, and consistency with the planned work scope. This process verifies the submitted estimate adequately reflects the contract scope of work and provides a reasonable assessment of the cost to accomplish all tasks. It confirms the estimate is traceable and accurate, and reflects realistic assumptions. It is good business practice for cost estimators and organizations independent of the program office to validate that all cost elements are credible and can be justified by acceptable estimating methods, adequate data, and detailed documentation.

The result of the ICR is a report that identifies any major Findings and Observations that will provide EMCBC Contracting decision-makers with an assessment of the quality of the estimate.

- **Findings** are significant deficiencies within the contractor's estimate and must be addressed prior to determining price reasonableness of the estimate. Findings within an estimate would include deficiencies such as:
  - Major work scope is omitted
  - Estimate definition is inconsistent with project execution status
  - Quantity development is not consistent with technical requirements
  - Peer review was not conducted by site/project technical team
  - Appropriate estimate metrics were not used to validate estimate during peer review
  - Qualitative or quantitative deficiencies are present that affect the usefulness of the estimate
- **Observations** are suggested changes that could be made to the estimate to improve its quality, but are not structural deficiencies that affect the use of the estimate for its intended purpose. Observations are provided to the site DOE Office of Contracting for consideration and possible estimate revision. The contractor is not required to act on Observations, but rather should use this information to improve the validity of the estimate.

2.2 ICR Team Composition

This ICR was prepared by EMCBC OCE. The individuals involved and their roles are identified in the following table:

Name	Organization	Phone number/E-mail	Role
Steve Olszewski	EMCBC, Senior Cost Engineer	(513) 246-0231 Steve.Olszewski@emcbc.doe.gov	Co-Author and Estimator
Russ Donaldson	EMCBC, Senior Cost Estimator	(513) 246-1371 Russ.Donaldson@emcbc.doe.gov	Reviewer
Daniel Dionne	EMCBC, Cost Estimator	(513) 744-0982 Daniel.Dionne@emcbc.doe.gov	Co-Author and Estimator
Andrew Weber	NSO, Project Control Specialist	(513) 246-0557 Andrew.Weber@nnsa.doe.gov	NNSS Point of Contact

2.3 ICR Key Evaluation Criteria

The ICR assessment team conducted a thorough review of the estimate, all supporting documentation, and associated work packages for cost realism, reasonableness, completeness, consistency, and compliance with generally accepted DOE and industry cost estimating processes.

This ICR sufficiency assessment review evaluated the following attributes associated with the estimate submitted by DOE Contractor:

- Traceability. Information is presented in a traceable fashion, containing supporting documentation and technical data. The EM ICR team must be able to evaluate and crosswalk between all cost estimates and the scope of work that the estimate captures.
- Reasonableness. Information is presented in a logical manner and can be evaluated at a sufficient level of detail to allow the ICR team to assess the reasonableness of estimated costs. Estimating methodologies used to develop the estimate(s) are reasonable given the project scope definition.
- Soundness. Information, assumptions, and recommendations presented within the estimate must be evaluated to assure they are valid. The ICR team will carefully consider costs based on expert judgment, and review assumptions used to develop cost estimates.
- Verification. Information presented must be verifiable by the ICR team. The ICR team will assess databases used to verify the technical parameters on the cost elements.
- Validity. Information presented must be logically correct, justifiable, and well-grounded. The ICR team will review the ground rules and assumptions. The ICR team will assess cost estimate components (material, labor rates, production rates, subcontract estimates, etc.) to verify reasonableness of costs used in the estimate.
- Accuracy/Consistency. Information presented is well organized, cohesive, supportable, and easily understood.
- Completeness. Information presented must contain all necessary data, assumptions, and pertinent information.

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The key evaluation criteria evaluated during this ICR assessment included the following areas:

- Estimating Methodology & Procedures
  - What estimating methods, techniques, and procedures were used to prepare the estimate?
  - Is the level of detail in the estimate sufficient for the purpose of the estimate?
  - What adjustments were made to the estimate to account for location, complexity, etc., and are they reasonable?
  - Was the estimate prepared using the approved project WBS and cost account structure?
  - Does the estimate roll-up in a logical fashion, with appropriate application of site and project-specific indirects?
  - Is every cost appearing on the estimate summary traceable to the estimate detail and other estimate backup documentation?
- Estimate Validation
  - Has the site provided key estimating metrics and benchmark ratios for the estimate and similar past projects?
  - Has the site performed any check estimates of the major project features captured in the estimate?
- Estimate Detail
  - The goal is to spot check that selected areas of the estimate can withstand further scrutiny. These tasks can be identified by applying the Pareto Principle (The 80/20 Rule), which states approximately 80 percent of the project cost is contained in 20 percent of the tasks. Because these significant tasks account for most of the project cost, they should receive prime emphasis and effort during the ICR sufficiency assessment review. Review of every item is not essential: if the basis, discipline, methods, and metrics are excellent and in accordance with requirements, there is a high probability the cost estimate result is of high quality. Perform selected drill-down to evaluate reasonableness:
    - Labor and crew composition
    - Production rates
    - Equipment usage & rates
    - Labor rates & hours
    - Unit cost modifiers or adjustments
    - Quantity development
    - Material costs
    - Direct cost adders

The level of detail and diligence used during the ICR assessment will vary with the strategic importance, total value, and purpose of the estimate.

The focus of the “review” phase of the ICR is typically qualitative in nature and focused on ensuring the estimate technically meets requirements (i.e., the “review” phase serves as a quality assurance and control function). This quality review determines whether the estimate was developed using contractually or procedurally required practices, tools, and data, whether it covers the entire project scope, whether it is free from error and omissions, and whether it is structured and presented in the expected format.

The focus of the "validation" phase of the ICR is typically quantitative in nature and is meant to ensure the estimate meets the project expectations and requirements regarding its appropriateness and competitiveness, and to identify improvement opportunities. The estimate is typically benchmarked against or compared to various cost metrics and/or cost targets, including third party published data from the public domain (desired), similar completed projects from site historical data (acceptable), or past detailed estimates (not recommended, but allowable if those estimates have been updated to reflect actual project experience). Validation examines the estimate from a different perspective and using different metrics than are used in estimate preparation.

2.4 ICR Methodology Used for the NSO RCRA Cell Work

The Estimate Summary submitted by DOE Contractor consisted of nine categories for Direct Construction Costs. This portion of the estimate was the cost driver—or major estimate element—whose sensitivity would impact the total project cost. In addition to the Direct Construction Costs, the estimate provided a detailed breakdown of indirect and distributable costs including project management, subcontractor overhead and profit, architectural and engineering, bond and liability insurance, EM direct support, infrastructure, general and administrative, fixed fee, contingency, and escalation markups.

Each of the Direct Construction Costs was analyzed; each line item was examined at the lowest level provided, following the guidance stated previously in this report. All Findings and Observations were collected and are documented in Section 3.

The ICR grouped the Direct Construction Costs into six categories. These categories were subjected to parametric estimating techniques and sampling techniques. For this report, the ICR groupings are as follows:

- Project Management & Engineering
- Site Improvement
- Excavation/Grading
- Leachate System
- RCRA Cell Liner
- Other Markups

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3. NSO ICR Assessment

EMCBC OCE conducted an ICR of DOE Contractor Estimate for a RCRA Compliant Cell in Area 5_S/C Nevada Test Site. The objective was to perform and document an ICR of the DOE Contractor submitted estimate to provide EM decision-makers with an assessment on the quality of the cost estimated for this effort. The ICR included an evaluation of the estimate for a single disposal pit, 150 ft. wide x 300 ft. long x 20 ft. deep supported with a leachate system and site improvements utilizing the seven key criteria identified in Section 2.3 of this report. The following sections of this report document the Findings and Observations for each grouping of the estimate.

Table 3-1. Summary of Direct Construction Costs Review

Category / Focus	Findings	Observations
Project Management & Engineering	• Detail sufficient • Consistent labor rates applied	• Applicable tasks • Reasonable and applicable personnel assigned
Site Improvements	• No Findings	• Fencing pricing validated with check estimate • Clearing and grubbing validated with check estimate • DOE Contractor did not price access road
Excavation & Grading	• Materials, equipment, and labor rates verified as reasonable	• Excavation volumes matched parametric check estimate • Excavated volume unit cost reasonable • Construction equipment for excavation valid and justified • Diesel fuel estimated by DOE Contractor was high per unit (more than double) • Fuel usage rates found to be reasonable
RCRA Cell	• No Findings	• HDPE Liner pricing validated • Geotextile liners and geosynthetic clay cross checked and reasonable
Leachate System	• No Findings	• 200,000 gallon tank and sump pumps costs reasonable • Piping costs checked and validated • Electrical materials validated • Tank foundation, excavation, and concrete unit costs reasonable
Other Markups	• No Findings	• Estimate rolled up in logical fashion • Contingency for total project cost found to be high • Contingency applied to Fixed Fee

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3.1 Project Management and Engineering

Engineering and Project Management category includes Engineering Design, Coordination, Design Review, Quality Control, Project Management, Estimating, Project Control, and Procurement.

3.1.1 Findings

There are no Findings associated with the Project Management & Engineering review. The level of detail was found to be sufficient. Professional labor rates were checked and consistently compared with rates provided by the May 2008 State Occupational Employment and Wage Estimates for the state of Nevada from the Bureau of Labor Statistics (escalated to 2009 and adjusted for fringe benefits).

3.1.2 Observations

The tasks estimated for Project Management & Engineering are applicable to the scope of work to be completed. Project Management tasks included project coordination and creation of the cost estimate and project schedule. Engineering tasks included preliminary design, design review, and final design of the RCRA Cell. No task was found to be unnecessary.

We observed the personnel assigned to complete these tasks are reasonable and expected for a project of this scope.

3.2 Site Improvements

Site Improvements category includes site clearing and grubbing and erecting a chain link fence.

3.2.1 Findings

There are no Findings associated with site improvements.

3.2.2 Observations

Using RACER, Version 11.0 (Remedial Action Cost Estimating Relationship), a parametric estimating tool, and R.S. Means, a check estimate was developed to erect a 2,440 foot long, chain link fence, industrial, galvanized steel, 3 strands barbed wire, 2” posts at 10’ O.C., 9 ga. wire, 6’ high, schedule 40 with double swing gates, 6’ high, 20’ opening. The check estimate developed was 4.2% lower than the estimate for this site improvement from DOE Contractor. The Estimate was thus validated as acceptable.

The DOE Contractor Estimate did not provide any details about the brush density, which would have established the level of clearing and grubbing needed before construction. A light density was assumed.

We also observed the DOE Contractor estimated 10 acres of clearing and grubbing. The cost obtained through RACER is comparable to the DOE Contractor’s estimate. The ICR assumed the large area for site clearing included clearing along the access road as well as the area planned for the disposal cell.

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It is worth noting that the DOE Contractor Estimate did not include any cost for the construction of an access road. The DOE Contractor Conceptual Design Report for the Waste Disposal Facility included a plan view of the access road approximately 1500' long and 20' feet wide. Assuming this site improvement does not exist, the estimated cost of an access road of this size would have a direct construction cost around $100,000 or about 3.5% of the total construction cost.

3.3 Excavation and Grading

The Excavation and Grading category includes all work involved in the construction of the disposal pit and the access ramp to the disposal pit. These work elements comprised approximately one-third of the direct construction costs for the disposal cell from the DOE Contractor Estimate. This was a critical focus or major project feature of the ICR.

3.3.1 Findings

There are no Findings within Excavation & Grading. The cost estimate components (material, equipment, labor rates and production rates) were assessed and verified as reasonable costs used in the Estimate.

3.3.2 Observations

The volume of excavated material estimated was reasonable and was checked against a parametric model. Volumes calculated very closely.

The unit cost per unit volume of excavated material was found to be reasonable, with less than an 8% difference between the parametric model and DOE Contractor Estimate. The disposal cell excavation was modeled to estimate $1.65 / CY versus the DOE Contractor Estimate of $1.79 / CY.

The types of equipment used in the DOE Contractor Estimate would be expected for a project of this scope (i.e. water truck, dozer, scraper, and roller). The equipment estimated is valid and justified.

It should be noted diesel fuel was estimated to cover 170 equipment-days at 60 gallons per day. The unit cost used to calculate the estimate for equipment fuel was $5.75 per gallon. Although actual costs experienced during 2008 were significantly higher, the cost for diesel fuel was reduced by more than 50% since the summer of 2008 when compared to current costs. According to Energy Information Administration for Gasoline and Diesel Fuel Update (https://www.eia.gov/petroleum/gasdiesel/), current average price for diesel fuel in the West Coast Region is $2.641 per gallon.

Using an average between the summer 2008 peak and current prices, a $3.82/gal rate applied at the usage quoted would be $38,964 reducing the estimate for fuel by about $20,000. The 60 gallons per day rate is reasonable given the amount of equipment being used.

3.4 Leachate System

The Leachate System category includes the 200,000 gallon water tank, sump pumps, piping, and the construction of the foundation for the tank. The leachate collection liners were included in section 3.5 below.

3.4.1 Findings

There are no Findings within the Leachate System.

3.4.2 Observations

The cost for the 200,000 gallon tank was validated against the cost for a similar tank listed in RACER. This proved the DOE Contractor Estimate for the 200,000 gallon tank is reasonable. The estimate for the sump pumps were confirmed as reasonable using the same method.

A check estimate was developed for the piping costs using RACER and found to be reasonable.

The electrical materials were a small contribution to the total cost of the estimate but were cross-checked in RS Means and found to be reasonable.

The storage tank foundation excavation and concrete unit costs are reasonable. Detailed drawings would be necessary to determine whether the volume of excavated material and concrete fill provided in the Estimate are reasonable.

3.5 RCRA Cell Liner

The RCRA Cell Liner category included all liner layers, liner leak tests, the sand bed, and the Type 2 aggregate layer on top of the liners. This grouping includes construction of the trench to secure the liners around the perimeter of the disposal cell as well.

3.5.1 Findings

There are no Findings with the estimate for the RCRA Cell Liner.

3.5.1 Observations

According to RS Means the unit cost (material & labor) for installation of a 60 mil HDPE liner was within 8% of the DOE Contractor estimate. It is assumed the DOE Contractor estimate is higher because of the equipment needs for installation that RS Means does not account for, namely the fusion machine. DOE Contractor estimated the 80 mil HDPE liner to be $0.07 / SF greater, which is reasonable.

The geotextile liners and geosynthetic clay were cross checked with unit prices obtained from RACER and the costs were found to be reasonable.

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3.6 Other Markups

Other Markups category includes all the distributable costs, indirect costs, contingency, escalation and adders to the Total Estimated Cost (TEC).

3.6.1 Findings

There are no Findings for the review of the Other Markups.

3.6.2 Observations

The estimate rolled up in a logical fashion, with appropriate application of site and project-specific indirects as stated in the Basis of Estimate.

Total project Contingency is provided at 25.1%. This rate is high for a project with lower complexity such as excavation for a RCRA disposal cell. The complexity is thought to be lower, as there are disposal cells near this proposed cell; historical costs are likely to be available, and it is a known technology.

Contingency is defined as the specific provision for unforeseeable elements of cost within the defined project scope. Contingency is particularly important where previous experience relating to estimates and actual costs has shown unforeseeable events which will increase costs are likely to occur. This was not brought forth in the Basis of Estimate.

It should be noted the DOE Contractor Estimate TEC Contingency Worksheet applied a rate of 28.6% to the cost estimate for the Fixed Fee. This should not be applicable. This component of the estimate was nearly $100,000.

4. Conclusion

EMCBC OCE conducted an Independent Cost Review (ICR) of DOE Contractor Estimate for a RCRA Compliant Cell in Area 5_S/C Nevada National Security Site (NNSS).

Based on the review of the DOE Contractor Conceptual Design Report for the Waste Disposal Facility and an analysis of the estimate for the work, the DOE Contractor Estimate was found to be valid and reasonable. The ICR Team did make some Observations during the review process.

All major cost categories or project features captured in the estimate were identified and validated using a combination of the RACER parametric estimating tool and available cost books such as RS Means. All mathematical extensions and additions were reviewed and checked for correctness. The level of detail in the Estimate was found to be sufficient for the purpose of the estimate.

Observations are included regarding elements in each category. These Observations should be reviewed and discussed at the site as deemed necessary.

EMCBC OCE further recommends NNSS proceed with the next phase of the RCRA Disposal Cell acquisition.

Appendix F Peer Review Checklist

The following is a take-off from the EMCBC OCE – Peer Review Checklist. The Checklist is typically completed by the reviewer upon the completion of the estimate and any issues should be resolved by the estimator prior to making the estimate final. A copy of the final checklist should be retained along with the final estimate.

Project Title:		**EMCBC OCE - Peer Review Checklist**				
Site / Location:						
Estimated By:						
Reviewed By:						
Date:		**FOR REVIEWER**				**FOR ESTIMATOR**
		Yes	**No**	**n/a**	**Reviewer Comments**	**Estimator Resolution**
ITEMS OF CONSIDERATION						
Estimate Planning						
1	Was an estimate plan established and included in the appendices of the BOE?					
2	Does the estimate plan follow the Estimate Plan Procedures?					
Estimate Software						
3	Was the estimate prepared using estimating software?					
4	Were Project Properties identified and documented?					
5	Is the estimate organized and costed by the Work Breakdown Structure to the appropriate level?					

6	Do estimate notes clearly identify and define assumptions upon which significant items of the cost estimate are based?					
7	Were productivity factors considered and included in the Estimate (Overhead work; Congested work; PPE requirements)?					
8	Are material, equipment or supply resource quotes documented?					
9	Are current contract labor rates and provisional mark-ups used?					
10	Were mark-ups applied according to standard?					
Estimate Considerations						
11	Were costs included for mobilization, demobilization, and preparatory work?					
12	Does the scope include disposal and if so, were transportation, container, and tipping fees considered?					
13	Were shrink, swell, waste & loss, and other appropriate factors identified and applied in the cost estimate?					
14	Is PPE needed and included at the correct level (A,B,C or D)?					
15	Were work requirements for safety considered (Fall					

	protection; LOTO; Hot work; CSE; etc.)					
16	Does labor fall under a collective bargaining unit and were provisional markups or CBA applied?					
17	Does the period of performance merit escalation application? (If so, what was its source?)					
18	Was appropriate sales tax applied to material and/or supply costs?					
19	Are local taxes applicable (Business & Occupation, city, and county fees, etc.)?					
20	Was profit/fee included (as Owner Mark-up per standard)?					
Basis of Estimate						
21	Was a BOE prepared to the appropriate level of detail?					
22	Was the estimate summarized by Cost Element?					
23	Do all rows and columns within the Cost Summary Tables add up (no calculation errors)?					
24	Is the Estimate quantified/classified appropriately (AACEi)?					
25	Does the estimate classification match the level of detail?					

26	Was all backup data referenced included in the BOE or its Appendices?					
27	Was BOE reviewed regarding use of grammar, spelling, punctuation, spacing, and general conventions?					
Peer Reviewer Notes:						